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MANAGING RISKS IN FORESTRY OPERATIONS

Draft
Code of Practice

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DRAFT FOR PUBLIC COMMENT

This draft model Code of Practice for *Managing Risks in Forestry Operations* has been developed to support the model Work Health and Safety (WHS) Act and Regulations, developed by Safe Work Australia under the *Intergovernmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety*.

Since 1 January 2012, six jurisdictions have implemented new WHS laws based on the model WHS laws: Queensland, New South Wales, Tasmania (with a commencement date of 1 January 2013), the Northern Territory, the Australian Capital Territory and the Commonwealth.

This draft Code aims to provide practical guidance for duty holders in forestry operations on how to eliminate or minimise the risks.

What is the purpose of public comment?

In releasing the draft model code for public comment, feedback is sought on whether the draft code of practice:

- is helpful and easy to understand
- reflects the current state of knowledge and technological developments in relation to managing various risks
- has an appropriate level of information or is too detailed including whether the information would be better dealt with in specific guidance
- requires additional examples or case studies to provide further clarification.

In addition to the above, feedback is sought on the following issues:

1. Guidance on 'driving trees'.

Currently section 6.1 states that the practice known as '*driving trees'*, that is, felling a second tree into another tree in order to bring down the first tree, should not be undertaken at any time due to fatalities or serious injuries were sustained by fallers carrying out the practice. However there is a view that in many cases it is the only option left open to hand fallers to bring down the tree if no mechanical assistance is available or possible, particularly on steeper slopes being harvested by cable logging. Some also consider that a "Level 3" or "advanced" accredited hand faller should have the skills and experience needed to safely 'drive' a tree when working in timber plantations.

Comment is sought under which circumstances, if any, driving trees should be provided for in the Code.

2. Use of holding wedges with trees that are manually felled with a chainsaw.

Section 6.2 and Figure 6.2 recommend and illustrate the use of a holding wedge in the back cut of trees (other than heavy forward-leaning trees) that are manually felled with a chainsaw.
Holding wedges are widely accepted as being an effective control measure in preventing a tree from sitting back on its stump during the felling process and therefore greatly reducing the risk of injury to the faller.

Should the practice of using a holding wedge apply to all trees that are manually felled with a chainsaw, or should alternative falling techniques be included for smaller trees, such as cypress?

3. Location of the log truck driver when loading and unloading.

Currently, section 9.1 states that the driver must remain in a pre-arranged location outside the work area of the loading machine, preferably in the loader's line of sight and at least 4m in front of the truck. There are differing approaches to this across the industry, with some jurisdictions allowing the driver the option of remaining inside the vehicle cabin while loading and unloading operations are taking place.

Comment [U1]: I support this view

Comment [U2]: Currently I do not see these accreditations adequate for the use of "driving trees".
I believe to be clear, there needs to be a clause that highlights a level of experience of the operator, and long term exposure to the environment.

Comment [U3]: I believe the use of "driving trees" is reasonable, however I don't believe there currently exists a qualification that meets the level of experienced required to do it safely. For that reason, I believe the COP should steer clear of stating an accreditation level, and instead make a general statement about level of experience.

Comment [U4]: No. There are times when it is reasonable for an experienced operator to elect to not use a holding wedge.
It would be more appropriate to expect holding wedges to apply to all inexperienced operators. i.e. Level 1 + 2

Comment is sought on the most practicable and safe location for the driver during loading and unloading.

4. Inclusion of required competencies

Should the code include information on the type of competencies needed for undertaking the various forestry operations, for example the national units of competency for forestry operations that are included in the Forest and Forest Products Training Package (FPI11)?

5. Reference to Australian Standards

There are a wide range of Australian Standards that apply to forestry operations which competent persons should be aware of and apply as required, for example, in the design and manufacture of Operator Protective Structures (ROPS/FOPS), safe working practices and the safe operation of plant and equipment.
There is a view that codes of practice should not reference Australian Standards unless the entire standard is relevant, as it places an expectation on duty holders to comply not only with the code, but also with the referenced standard. Technical standards can be revised at any time and they may or may not provide the most appropriate information in relation to managing health and safety risks. Small businesses may have fewer resources to purchase Australian Standards than larger businesses. Comment is sought on whether it is necessary to reference particular technical standards in the Code of Practice.

Comment [U5]: Yes, but this should not be used as a measure of competence.
Perhaps for demonstratably inexperienced operators, these should be considered entry level or learners permits for a new generation of forest workers.
I think there needs to be some kind of 'grandfather' clause to protect older workers.

Comment [U6]: I am not aware enough of the implications of YES/NO to have an opinion.

The draft model Codes of Practice have been developed to reflect the requirements of the model WHS Regulations and include references to specific regulations. Comments should not focus on the regulations themselves but on the guidance that is needed to comply with the WHS Regulations.

How do you make a submission?

You can provide your comments as an individual or you may wish to contribute to a joint submission through your employer or union organisation, professional association, safety group or community forum. It is encouraged that wherever possible, you should include evidence and examples to support your views on the draft model code.

A Public Comment Submission Cover Sheet and the Public Comment Response Form are provided for making written submissions. These are available on the Safe Work Australia website at www.safeworkaustralia.gov.au.

It is preferred that submissions are typed and submitted electronically to the following email address: codes@safeworkaustralia.gov.au. If you are unable to email your submission, you can post it to:

Safe Work Australia
Attn: Codes Public Comment
PO Box 641
Canberra ACT 2601

When a submission is received by Safe Work Australia via email, an automatic response will be sent to confirm receipt. We do not send individual responses to submissions received by mail.

All submissions will be made accessible to the public on the Safe Work Australia website, unless marked 'IN CONFIDENCE'.

The closing date for making a submission is **Friday 24 August 5pm AEST.**

What happens after the public comment period closes?

Safe Work Australia will analyse all written submissions that are received during the public comment period. Safe Work Australia will review and as necessary revise the model Codes of Practice.

The revised model Codes of Practice will then be considered by the Ministerial Council for adoption as part of the harmonised WHS laws.

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FOREWORD

This Code of Practice on managing health and safety risks in forestry operations is an approved code of practice under section 274 of the *Work Health and Safety Act* (the WHS Act).

An approved code of practice is a practical guide to achieving the standards of health, safety and welfare required under the WHS Act and the Work Health and Safety Regulations (the WHS Regulations).

A code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in the WHS Act, in relation to the subject matter of the code. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks which may arise. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the WHS Act and Regulations. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

Compliance with the WHS Act and Regulations may be achieved by following another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety than the code.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice.

This Code of Practice has been developed by Safe Work Australia as a model code of practice under the Council of Australian Governments' *Inter-Governmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety* for adoption by the Commonwealth, state and territory governments.

A draft of this Code of Practice was released for public consultation on [*to be completed*] and was endorsed by the Workplace Relations Ministers Council on [*to be completed*].

SCOPE AND APPLICATION

This Code provides practical guidance for persons conducting a business or undertaking who have work health and safety duties under the WHS Act and Regulations on how to eliminate or minimise risks associated with forestry operations.

This Code applies to all forestry operations, including the harvesting and haulage of trees in the traditional hardwood sector, the softwood plantation sector and the emerging hardwood plantation sector. It also applies to farm forestry and single operator post, sleeper and firewood cutting operations.

How to use this code of practice

In providing guidance, the word 'should' is used in this Code to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

This Code also includes various references to provisions of the WHS Act and Regulations to provide context with legal requirements. These references are not exhaustive. The words 'must', 'requires' or 'mandatory' indicate that these legal requirements exist, which must be complied with.

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1. INTRODUCTION

1.1 What are forest operations?

A forest operation means work done in the forest industry in:

- the formation, development and regeneration of forests
- obtaining forest produce
- the loading, transporting and unloading of forest produce
- post operative assessment
- work in addition to areas of the above, including:
    - clearing, fencing, trenching or draining, and
    - establishing, maintaining and upgrading roads, tracks and log landings.

There are a number of hazardous activities carried out in forest operations that can result in serious injury and death. The risks are increased because forest environments are dynamic and often unpredictable. Most forest operations also involve multiple business operators and contractors working simultaneously at the one site. This mix of working relationships will often include owners or controllers of land, forest managers, timber business owners, principal contractors, contractors, suppliers of plant, self-employed people and workers.

Each of these groups of people have health and safety duties under the WHS Act and Regulations.

1.2 Who has health and safety duties in relation to forestry operations?

A person conducting a business or undertaking has the primary duty to ensure, so far as is reasonably practicable, that workers and other persons are not exposed to health and safety risks arising from the business or undertaking.

This duty requires the person to manage risks by eliminating health and safety risks so far as is reasonably practicable; and if it is not reasonably practicable to eliminate the risks, by minimising those risks so far as is reasonably practicable.

There are more specific requirements to manage risks under the WHS Regulations, including those associated with fatigue, hazardous chemicals, remote and isolated work, noise, hazardous manual tasks and plant.

Persons conducting a business or undertaking may include land owners, forest managers, timber business owners and contractors.

Designers, manufacturers, importers and suppliers of plant, substances or structures used in forestry operations must ensure, so far as is reasonably practicable, that the plant, substance or structure they design, manufacture, import or supply is without risks to health and safety. This duty includes carrying out testing and analysis as well as providing specific information about the plant or structure.

Officers, such as company directors, have a duty to exercise due diligence to ensure that the business or undertaking complies with the WHS Act and Regulations. This includes taking reasonable steps to ensure that the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks from forestry operations.

Workers have a duty to take reasonable care for their own health and safety and that they do not adversely affect the health and safety of other persons. Workers must comply with any reasonable instruction and cooperate with any reasonable policy or procedure relating to health and safety at the workplace. If personal protective equipment is provided by the

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person conducting the business or undertaking, the worker must use it in accordance with the information, instruction and training provided.

Other persons at the workplace, such as visitors, must take reasonable care for their own health and safety and must not adversely affect the health and safety of other persons. They must comply, so far as they are reasonably able, with any reasonable instruction given by the person conducting the business or undertaking to allow that person to comply with the WHS Act.

Table 1 below shows examples of typical activities of persons involved in forest operations to meet their health and safety duties.

Table 1: Examples of typical responsibilities in forestry operations	
Controllers of land	• Ensure roads are appropriately built and maintained. • Provide information on known hazards. • Enable safe access to work area.
Land owners or forest managers, timber business owners, principal contractors	• Select competent contractors • Pass on information about known hazards • Conduct a job safety analysis in consultation with contractors • Decide on the appropriate harvesting method • Allocate coupe/harvesting sites and schedules according to contractor skill and equipment • Ensure work can be safely conducted in the allocated time • Establish emergency procedures • Develop traffic management plan • Establish consultation arrangements • Ensure compatible communications equipment for all contractors • Monitor and supervise contractors to ensure safe system of work
Contractors	• Select competent sub- contractors • Provide suitably maintained plant • Obtain licences and authorisations • Ensure only trained and competent workers are used • Supervise work practices • Check safety information about coupe/harvesting site/work area • Confirm communication and emergency procedures • Implement safe work procedures • Provide suitable PPE • Ensure first aid is available • Coupe and task assessment
Designers, manufacturers, suppliers	• Supply plant with proper operator protective structures and other necessary guarding • Provide users with information about safe use of plant or substances
Workers	• Follow safe work procedures • Not put themselves or others at risk • Report incidents • Comply with any reasonable instruction • Undertake training as required • Correctly use PPE that is provided for job tasks

Comment [U7]: I believe there also needs to be a strong emphasis on protestors.
Within the limitations of respecting peoples right to protest, a strong part of popular protesting strategy is to intentionally place themselves or workers to great risk in order to stop work.
A mechanism such as this that allows contractors to be able to handle protests that are unsafe would be a huge improvement in safety to the industry, and the code of practice.

Comment [U8]: I believe this whole table is appropriate, and a good example.

Comment [U9]: Well done!

Comment [U10]: Well done again!

1.3 What is involved in managing risks associated with forestry operations?

Risk management is a systematic process for identifying hazards in a workplace and eliminating or minimising, so far as is reasonably practicable, the risks associated with those hazards. The process consists of the four steps set out in Chapter 2 of this Code:

- identify hazards – find out what could cause harm in forest operations
- if necessary, assess risks associated with the identified hazards
- control risks by implementing the most effective control measure(s) and
- review control measures to ensure they are working as planned.

Further guidance on the risk management process generally is available in the *Code of Practice: How to Manage Work Health and Safety Risks.*

Consulting your workers

S.47: The WHS Act requires that you consult, so far as is reasonably practicable, with workers who carry out work for you who are (or are likely to be) directly affected by a work health and safety matter.

S.48: If the workers are represented by a health and safety representative, the consultation must involve that representative.

Consultation involves sharing of information, giving workers a reasonable opportunity to express views and taking those views into account before making decisions on health and safety matters.

Consultation with workers and their health and safety representatives is required at each step of the risk management process. By drawing on the experience, knowledge and ideas of your workers you are more likely to identify all hazards and choose effective control measures.

You should encourage your workers to report any hazards and health and safety problems immediately so that risks can be managed before an incident occurs.

Consulting, co-operating and co-ordinating activities with other duty holders

S.46 The WHS Act requires that you consult, cooperate and coordinate activities with all other persons who have a work health or safety duty in relation to the same matter, so far as is reasonably practicable.

There are usually a number of businesses or undertakings involved in timber harvesting operations who each have responsibility for health and safety, to the extent that they influence and control aspects of the harvesting activities.

In some situations sawmills may purchase wood directly from the land owner/forest manager on a stumpage basis, and then engage contractors to undertake the actual harvesting operations. Despite the sawmill engaging the contractor, for many operations the mill may have little knowledge or understanding of the harvesting operations and associated risks, and will rely on the harvesting contractor to address these issues. Likewise, private land owners may have very little knowledge or understanding of the harvesting operations and associated risks, and will also rely on the harvesting contractor to address these issues.

As the number of duty holders involved in the harvesting operations increases, so does the importance of consultation, co-operation and co-ordination between them (see Table 2). They need to share information and decide who is going to do what and work together to eliminate or minimise risks.

An example of how this can work is provided below:

XYZ is the principal contractor or forest manager that has been engaged to set up and manage a timber harvesting operation. The land owner has provided the forest manager with specific coupe hazard information. Both parties have health and safety responsibilities. Together, they decide which trees would be harvested, where the cut logs would be placed for loading on the truck, the best means of entering and leaving the harvesting site, and other matters related to the job.

XYZ engages harvesting and haulage contractors to fell, extract and deliver the cut logs to the mill.

XYZ meet with the harvesting and haulage contractors to discuss safety issues and to find out how the contractors manage the risks in the work the crews do. XYZ discuss their expectations and safety procedures. XYZ has put a clause into the contract that requires contractors to comply with health and safety requirements and to ensure the work will be done safely.

The contractors provide written copies of their safe work procedures. They consult and cooperate with XYZ regarding:

- *their supervisory and monitoring arrangements to ensure safe work procedures are followed and workers use appropriate personal protective equipment (PPE)*
- *the competency of crew members to ensure the safe operation of equipment*
- *the induction of workers and visitors to ensure that they are informed of the specific coupe hazards and work procedures, communication arrangements and specific safe work areas*
- *sequencing of the work, control measures that will be implemented, safe access to the site, and*
- *any work health and safety training and first aid training the crews may need.*

XYZ and the harvesting and haulage contractors inspect the work site together to assess the conditions and plan how the job will be done. They go over the equipment, methods and signage to be used, identify any foreseeable hazards and how to deal with them. They decide on the best ways to bring down certain trees safely, and discuss emergency procedures and ways to ensure unauthorised persons might be kept out of the area or kept from harm if they enter the forest.

Table 2: Possible scenarios for timber harvesting operations and duty holders

Harvesting operation scenario	Landowner harvests timber on own land for own use	Landowner / forest manager engages contractor to harvest, merchandise and deliver timber to mill door	Landowner / forest manager sells standing timber to a log purchaser on a stumpage basis (e.g. sleeper cutter), who harvests and processes the timber	Landowner / forest manager sells standing timber to a log purchaser on a stumpage basis (e.g. a sawmill), who in turn engages a contractor to harvest and haul the timber	Landowner / forest manager sells standing timber to a Log purchaser on a stumpage basis (e.g. a sawmiller), who engages a principle contractor who engages sub contractors to perform harvesting and hauling.
Parties on the harvesting site who are	Landowner only	Landowner / forest manager Contractor	Landowner / forest manager Log purchaser	Landowner / forest manager Log purchaser	Landowner / forest manager Log purchaser

conducting a business or undertaking				Contractor	Principle contractor Contractor
Complexity	Increasing number of businesses orr undertakings on the harvest site requiring consultation, co-operation and coordination in relation to their respective duty as a PCBU				

Further guidance on consultation is available in the *Code of Practice: Work Health and Safety Consultation, Co-operation and Co-ordination*.

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2. THE RISK MANAGEMENT PROCESS

Comment [U11]: I support this in principle, but I believe this deserves to be in its own document that can be referenced by the COP.

2.1 Identifying the hazards

The first step in the risk management process is to identify all of the hazards that could potentially cause harm to people. Hazards generally arise from three aspects of forest operations and their interaction. These are:

- the physical work environment
- the equipment, materials and substances used and
- the work tasks and how they are performed.

Potential hazards may be identified in a number of different ways, including:

- obtaining information about any known hazards from the landowner
- conducting a walk through assessment of the workplace
- observing the work and talking to workers about how work is carried out
- inspecting the plant and equipment that will be used during the forestry activity
- reading product labels, safety data sheets and manufacturer's instruction manuals
- talking to manufacturers, suppliers, industry associations and health and safety specialists
- reviewing incident reports.

Typical hazards found in forest operations can include:

- hazardous trees,
- being struck by falling objects or mobile plant
- rollover of mobile plant
- slips, trips and falls
- exposure to extremes of temperature, fatigue and noise
- changes in operating conditions such as weather, environmental requirements and unexpected ground conditions.

2.2 Assessing the risks

A risk assessment involves considering what could happen if someone is exposed to a hazard and the likelihood of it happening. A risk assessment can help you determine:

- how severe a risk is
- whether any existing control measures are effective
- what action you should take to control the risk, and
- how urgently the action needs to be taken.

A risk assessment is unnecessary if you already know the risk and how to control it.

To assess the risk associated with the hazards you have identified, you should consider the following:

What is the potential impact of the hazard?

- How severe could an injury or illness be? For example, lacerations, amputation, serious or fatal crushing injury, burns, loss of hearing
- What is the worst possible harm the hazard could cause?

How likely is the hazard to cause harm?

- Is it highly likely or unlikely to happen?
- How frequently are workers and the public exposed to the hazard?

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Table 3 provides examples of how risks may be assessed in forestry operations.

Table 3: Assessing the risks in forest operations

Hazard	Forest operations risk profile		
	Higher risk →		**Lower risk**
Operating machinery	Workers operating equipment that they have not been trained or assessed to operate	Workers have some training but not necessarily current or applicable to the equipment they are operating. Has only been assessed informally	Workers have been trained and assessed in the equipment they are operating
Falling objects	Workers with no protective canopy	Workers outside a protective canopy some of the time	Workers under protective canopy
Terrain and slope	Activity on steep slopes	Some activity on steep slopes	Activity on a flat ground
Hazardous trees	Most trees with a high proportion of dead limbs and/or intetlocked crowns.	Some trees with a high proportion of dead limbs and/or interlocked crowns	The majority of trees are healthy with regular form.
Working alone	Working alone without emergency procedures	Working alone with agreed emergency contact means and procedures	Working alone but within same area as others in constant communications
Felling methods	Felling done by hand with skill-based ability to control direction of fall	Mainly mechanical felling with hand felling only used as required	Felling done mechanically with ability to control direction of fall
Working at night	Working at night with poor visibility in a work area	Working at night where 'active' work area is clearly visible to all operations	Working at night where whole work is clearly visible to all operations

The more activities in the red zone, the greater the importance of the risk management system. With each of these risks, an assessment of the working conditions should be undertaken to identify the approach that eliminates or minimises risks in the high risk zone, and ensures activity is in the medium or lower risk zones.

2.3 Controlling the risks

The hierarchy of control

Some control measures are more effective than others. Control measures can be ranked from the highest level of protection and reliability to the lowest. This ranking is known as the *hierarchy of control*.

You must always aim to eliminate a hazard and associated risk first. If this is not reasonably practicable, the risk must be minimised by using one or more of the following approaches:

- *Substitution* – for example, use mechanical felling processes rather than manual felling
- *Isolation* – isolate the hazard from any person exposed to it. For example reduce emissions and noise from machinery through venting and containment; use a machine to shield workers from hazards on a log landing

- *Implementing engineering controls* – for example, the use of a roll over protective structure (ROPS) and falling object protective structures (FOPS) to protect the operator from the risks associated with a machine overturning or objects falling on them.

If risk then remains, it must be minimised by implementing *administrative controls*, so far as is reasonably practicable, for example job rotation and task variety can reduce the risks associated with repetitive manual handling tasks.

Any remaining risk must be minimised with suitable *personal protective equipment* (PPE), for example, by the use of safety eyewear, hearing protection, safety helmets, cut-resistant leg protection and reflective clothing.

Administrative control measures and PPE rely on human behaviour and supervision, and used on their own, tend to be least effective in minimising risks.

A combination of these control measures may be required in order to adequately manage the risks of forestry operations. You should check that your chosen control measures do not introduce new hazards.

2.4 Reviewing control measures

R.38 The WHS Regulations require that a person conducting a business or undertaking must review and, as necessary, revise control measures so as to maintain, so far as is reasonably practicable, a work environment that is without risks to health and safety.

Control measures must be reviewed, and if necessary revised, in the following circumstances:

- when the control measure is not effective in controlling the risk
- before a change at the workplace that is likely to give rise to a new or different health and safety risk that the control measure may not effectively control
- if a new hazard or risk is identified
- if the results of consultation indicate that a review is necessary
- if a health and safety representative requests a review.

The control measures that are put in place to protect health and safety should be regularly reviewed to make sure they are effective. The nature of the forest industry means that reviewing risk control measures may be required on a regular basis to deal with changes in daily working conditions.

For example, it is necessary to review control measures in consultation with workers and their health and safety representatives:

- when an injury or illness occurs because of a hazard that the risk assessment addressed, or failed to address
- before making changes or extensions to the nature of the forest operations
- before introducing new plant or harvesting techniques
- if new information becomes available to indicate that a control measure may no longer be the most effective and
- when there are changes to who is engaged to undertake work.

Controls can be checked by using the same methods as in the initial hazard identification. If problems are found, go back through the risk management steps, review your information and make further decisions about risk control.

3. PLANNING, COORDINATION and PREPARATION

Planning for the way a forest will be harvested can contribute significantly to the safety of any harvesting operation. Forest operations will normally include the elements of longer term planning and operational planning, as well as the specific harvesting and haulage activities. A sample harvesting plan is provided at Appendix B.

3.1 Longer term harvest plans

Over a 3-5 year period, decisions about areas to be included in forest harvesting plans can have an impact on WHS. This could include the development of wood utilisation or timber release plans. Forest managers may also have longer term strategic harvesting plans.

The decision-making process during this time frame should address:

- recognition of higher risk forest types (e.g. fire, snow, wind or insect damage)
- the suitability of road networks to access coupes/harvesting sites
- the availability of equipment and contractors capable of harvesting the areas of forests identified in plans
- potential conflicts between environmental requirements and safe work practices
- potential impacts of silviculture or management requirements on safe work practices.

3.2 Annual plans

Annual harvesting plans generally provide more detailed information about coupes/harvesting sites including location, road access and timing of harvesting.

At this stage of the planning process, forest managers should consider appropriate harvesting methods for specific coupes/harvesting sites and the selection and availability of contractors with suitable equipment and operator skills. Where practicable, coupes/harvesting sites should be allocated to a contractor after the contractor has had the opportunity to inspect the coupe/harvesting site to ensure they have suitable equipment and people to undertake the harvesting operation.

People responsible for allocated cutting areas should consult with harvesting and haulage contractors during the planning process. Issues to be addressed include:

- road closures
- the control of hazards identified on land adjacent to the harvesting coupe/harvesting site
- controls for known hazards in trees or patches of vegetation marked for retention
- factors such as slope or yield that will impede the rate of production
- the suitability of the available machinery considering factors such as slope, tree size and soil type
- the most appropriate method for harvesting timber (mechanical felling should be considered in preference to manual felling)
- competency of particular operators
- first aid and other emergency plans including the identification of emergency meeting points.

3.3 Operational plans (Forest coupe/harvesting site plan/timber harvesting plan)

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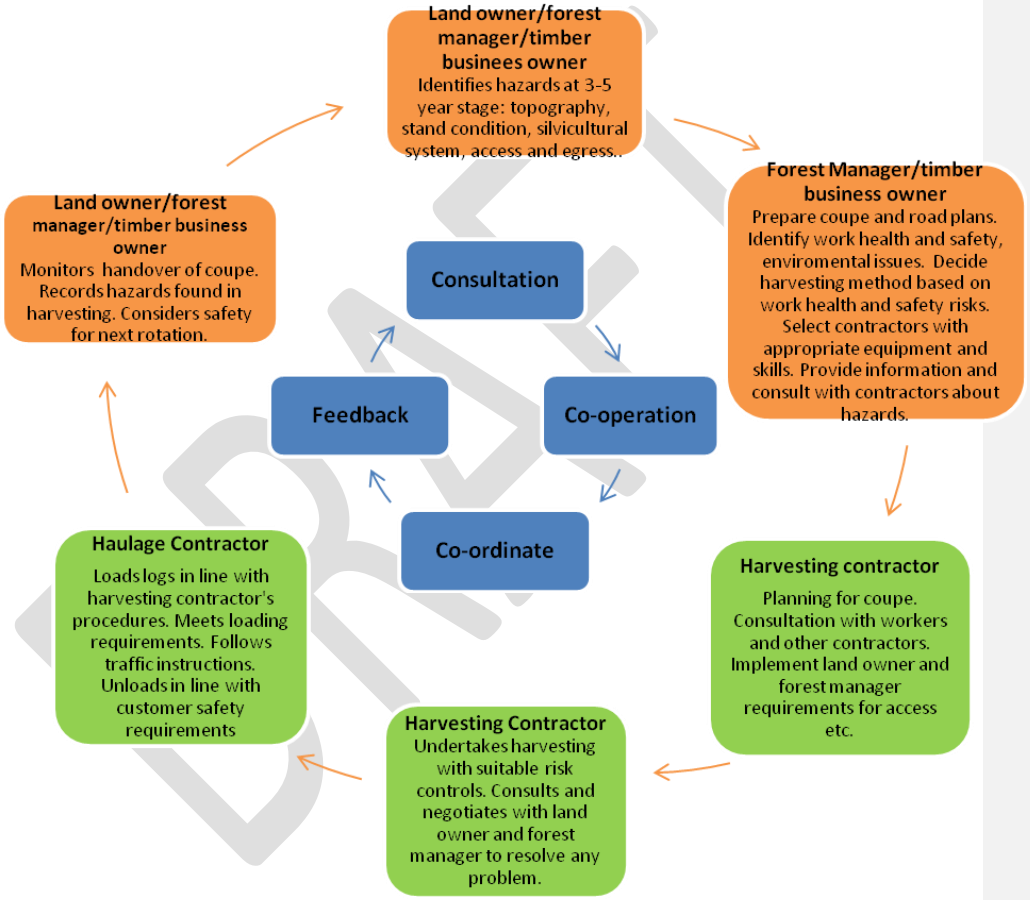
Maps and hazard reduction plans, which are generated as the coupe is handed over to the harvesting contractor, are important tools to ensure that accountability for the management of particular hazards is clearly addressed.

Figure 2 below illustrates the relationships between duty holders in conventional forestry operations, and the consultation and coordination cycle that underpins a successful planning approach.

Figure 2: Example of managing risks through consultation, co-operation and co-ordination between duty holders


Land owner/forest manager/timber businees owner
Identifies hazards at 3-5 year stage: topography, stand condition, silvicultural system, access and egress..
Forest Manager/timber business owner
Prepare coupe and road plans. Identify work health and safety, enviromental issues. Decide harvesting method based on work health and safety risks. Select contractors with appropriate equipment and skills. Provide information and consult with contractors about hazards.
Harvesting contractor
Planning for coupe. Consultation with workers and other contractors. Implement land owner and forest manager requirements for access etc.
Harvesting Contractor
Undertakes harvesting with suitable risk controls. Consults and negotiates with land owner and forest manager to resolve any problem.
Haulage Contractor
Loads logs in line with harvesting contractor's procedures. Meets loading requirements. Follows traffic instructions. Unloads in line with customer safety requirements
Land owner/forest manager/timber business owner
Monitors handover of coupe. Records hazards found in harvesting. Considers safety for next rotation.
Consultation
Co-operation
Co-ordinate
Feedback

At the planning stage, the land or forest manager/timber business owner/principal contractor who has engaged the contractors for forestry operations, should provide information about the coupe/harvesting site that may impact on safety. This includes:

- information on the physical terrain including slope and soil type
- information about the environmental and silvicultural objectives
- identifying the location of known dangerous trees and other hazards such as mine shafts, wells and erosion

- preferred location of log extraction tracks and log landings
- location and design of log extraction roads
- the location of modified harvesting zones for environmental protection (e.g. habitat protection, riparian buffers and filters.

Consultation between the land owner or forest manager/timber business owner/principal contractor at this stage is important to address problems before work commences. This is best achieved by both parties 'walking the ground' together, allowing contractors to select retained trees and landing locations to eliminate or minimise health and safety risks associated with silvicultural and environmental prescriptions.

During the coupe/harvesting site inspection, the contractor should consider the following as part of managing risks:

- The adequacy of landings, log dumps and roads, considering the type of mobile and fixed plant, the type and size of trucks and the size and number of log grades to be processed and stored
- The impact of weather conditions and delays, the adequacy of artificial lighting if operating at night, and any seasonal considerations (e.g. fire)
- Development of an initial plan to reduce risks involved with entering and leaving the coupe/harvesting site (e.g. likelihood of falling timber across roads or near roads, siting of log landings and visitor induction area)
- Assessment of how the nature of the coupe/harvesting site will affect work flows (e.g. felling -> extraction -> log preparation -> loading -> transport)
- Risk management or safety plan may be developed in consultation with workers (see example at Appendix B).

The land owner or forest manager/timber business owner/principal contractor and the harvesting contractor should identify and resolve any potential conflicts between WHS and environmental management requirements at this stage. The land owner or forest manager/principal contractor and the harvesting contractor should consult with workers (e.g. log truck drivers) on the system of work so that everyone involved in the forestry operation is prepared for the nature of the work to be undertaken.

3.4 Building WHS into the next harvesting cycle

WHS consideration in the planting and replanting stages of the forest cycle can help reduce potential hazards associated with operations undertaken later in the rotation. It is often easier to do this when there are no trees on the site.

For example:

- ensure the method of planting does not increase difficulties associated with future harvesting
- consider whether existing landings and road should be retained for future harvesting,
- identify and permanently record on maps particular hazards associated with an area of land, for example mine shafts or land slips.

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4. WORK HEALTH AND SAFETY PRACTICES and PROCEDURES

Everyone involved in forestry operations, from land owners and managers to harvesting and haulage contractors, should consider the following essential work health and safety elements when planning to manage the risks in forestry operations.

4.1 Information, training, instruction and supervision

S.19 The WHS Act requires a person conducting a business or undertaking to provide relevant information, instruction, training and supervision necessary to protect all persons from risks to their health and safety arising from work carried out.

R.39 A person conducting a business or undertaking must ensure that information, training and instruction provided to a worker is suitable and adequate having regard to:

- the nature of the work carried out by the worker
- the nature of the risks associated with the work at the time of the information, training and instruction, and
- the control measures implemented.

The training provided must be readily understandable by any person to whom it is provided.

Workers must be trained and have the appropriate skills to carry out a particular task safely. Training should be provided to workers by a competent person.

Induction training

In addition to any task-specific training, any worker undertaking forestry operations work must be provided with induction training to inform them of site specific hazards, familiarise them with the forestry operations and safe work procedures. Induction training should include:

- Forestry (site specific) hazards
- Emergency procedures
- Safe operating or work procedures
- Communication systems and radio frequency
- First aid and amenities
- Fatigue management
- Hazard and incident reporting
- Consultation arrangements and issue resolution processes
- Sites being used for the first time and operations being done for the first time

Refresher training and supervision

Even when there have been no changes to the forest operations, refresher training may be necessary to ensure that key work health and safety aspects are addressed and competencies are maintained. The monitoring of techniques and practices is important in maintaining adequate standards. For example, periodic inspection of the stumps of a manual feller may indicate poor techniques that create risks for the feller and others in the coupe/harvesting site.

Forest operations present particular challenges in maintaining effective supervision of work. Hazards can arise unexpectedly and many activities are away from the direct sight of the crew supervisor. Despite these challenges, effective supervision is essential in maintaining a safe and healthy work environment.

4.2 Safe work areas

In forest operations the risk of death or serious injury increases dramatically when operators are not effectively separated into safe work areas.

A work area is the active area of a coupe/harvesting site or site in which individual operators work. This work area is normally dominated by one activity such as manual felling or skidding. However, the nature of forestry operations means that there will often be several operators working in adjacent work areas. In the case of the log landing, there may be several operators in the one work area.

The greatest danger a person working in forestry operations faces is being struck by logs, trees or pieces of machinery as a result of activities in another work area.

A work area can be made into a safe work area by separating the work activities. This separation can be achieved in a number of ways:

Physical barrier: for example, a machine canopy or a parked (not operating) machine placed between ground-based workers and other working machines.

Distance: the common separation distance is two tree lengths of any tree being felled or snigged.

Time: risks are reduced by scheduling different parts of the process at different times. For example, log landing construction is completed ahead of the interaction with other activities.

Table 4: Examples of a safe work area

Activity	Operator(s)	Typical safe work area
Manual felling	Faller/skidder/forwarder operator	• Separation distance of two tree lengths (distance) • Entry by either operator into safe work area only by agreed protocol such as radio communication
Mechanical felling	Harvester operator/ forwarder/skidder	• Separation distance of two tree lengths (distance) • Separation by scheduling of work (time) • Entry by either operator into safe work area only be agreed protocol such as radio communication
Log Processing	Loader/skidder/forwarder /excavator/ log grader	• Separation distance of boom length plus half log length (distance), or in accordance with manufacturer's specifications. Adopt the greater specified distance. • Separation by barrier such as parked equipment (physical). • Entry by either operator into safe work area only by agreed protocol such as radio communications
Loading of log trucks	Loader/truck driver	• Truck driver in line of sight of leader operator and in designated safe area with separation distance of boom length plus half log length (distance) or • Truck driver at least 4 metres to the front or 10m to the back of the truck (distance) or • Entry by either operator into safe work area only by agreed protocol such as radio communication

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4.3 Risk assessment of ground conditions

Because of the changing nature of forestry operations and operating conditions, there are always a number of hazards that have to be continuously managed. One common hazard relates to machine stability under different ground conditions.

Risk assessments undertaken in the coupe/harvesting site should focus on the stability of the machine and the use of the machine within its design and manufacturer's specifications. The following factors should be considered in any risk assessment:

- Uphill or downhill operation
- Length of slope
- Magnitude (degree) of slope
- Size and arrangement of trees or logs relative to the weight of the machine
- Ground conditions such as broken ground, soil types, stumps, holes and rock
- Weather conditions

4.4 Communications

Forestry operations are conducted in an environment in which communication is not always easy. Noise, terrain, lack of line of sight, poor visibility and remote locations can all create problems for communication systems.

Effective communication practices include:

- Two-way radio communications between all workers in the coupe/harvesting site, as well as visitors to the site
- effective emergency communication systems
- agreed whistle or hand signals in operations such as cable logging
- signage

4.5 Emergency procedures

R.43 A person conducting a business or undertaking must ensure that an emergency plan that provides for emergency procedures and information, training and instruction for workers in relation to implementing the emergency procedures, is prepared and maintained for the workplace.

Planning for forestry operations needs to include the possibility of emergencies and the need for rapid evacuation of the work crew. Planning for emergencies should include:

- testing the communication systems within the site and to external contacts
- establishing an Emergency Meeting Point, making sure it is known to all workers and can be simply communicated to the emergency services (e.g. a signposted location or road intersection)
- listing of phone contacts in case of emergency, with details stored at multiple designated locations
- ensuring adequate transport will be available if evacuation is required
- confirming emergency procedures for working alone and "report in" protocols
- briefing all contractors, workers and visitors who will be working on site, about the emergency procedures.

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4.6 Personal protective equipment (PPE)

R.44 If personal protective equipment (PPE) is to be used at the workplace, the person conducting the business or undertaking must ensure that the equipment is:

- selected to minimise risk to health and safety
- suitable for the nature of the work and any hazard associated with the work
- a suitable size and fit and reasonably comfortable for the person wearing it
- maintained, repaired or replaced so it continues to minimise the risk
- used or worn by the worker, so far as is reasonably practicable.

R.46 A worker must, so far as is reasonably practicable, wear the PPE in accordance with any information, training or reasonable instruction.

PPE should only be used where other methods of controlling the risk are not reasonably practicable. Normally PPE should be used in conjunction with other methods of reducing risk, rather than being the only level of protection.

The effectiveness of PPE is highly dependent on individual work practices and therefore requires constant supervision and maintenance.

In some circumstances, the design of the plant and machinery will reduce the hazard and remove the requirement for workers to wear PPE. However, where PPE is required, selection, fit and upkeep of PPE is important, and consultation with the operators who have to wear the PPE is essential to get the best results. The PPE must be maintained and replaced if it is damaged or ineffective (e.g. damaged or worn soles on safety footwear may cause slippage and should be replaced).

Appendix C provides further information about PPE standards and lists of the types of PPE that should be used in forest operations.

4.7 Workplace facilities

R.41 A person conducting a business or undertaking must ensure, so far as is reasonably practicable, the provision of adequate facilities for workers, including toilets, drinking water, washing and eating facilities. These facilities must be in good working order, clean, safe and accessible.

For further information on the provision of adequate workplace facilities, refer to the *Code of Practice: Managing the Work Environment and Facilities.*

4.8 First aid

R.42 The WHS Regulations place specific obligations on a person conducting a business or undertaking in relation to first aid, including requirements to:

- provide first aid equipment and ensure each worker at the workplace has access to the equipment
- ensure access to facilities for the administration of first aid, and
- ensure that an adequate number of workers are trained to administer first aid at the workplace or that workers have access to an adequate number of other people who have been trained to administer first aid.

First aid requirements will vary from one workplace to the next, depending on:

- the nature or type of work performed (e.g. tree felling, skidder operation)
- the types of injury/illness likely to be sustained (e.g. cuts, fractures, amputations, stings, bites)
- the size and layout of the work area (e.g. the size of the coupe/harvesting site)
- the number and distribution of workers, and
- the location of the work area (e.g. distance and time to nearest medical centre).

First aid kits must be accessible on the worksite and kept in vehicles or in otherwise agreed locations.

A trained first aider should be available within the working area. Where there is only one trained first aider in a crew, this should not be a feller. Remote first aider training is recommended as the minimum for at least two workers and, where possible, all other workers should have basic first aid knowledge in case the trained first aider is not immediately available.

All workers should be informed of the location of the first aid supplies and the procedures for replacement of stock.

Further information on first aid is available in the *Code of Practice: First Aid in the Workplace.*

4.9 Incident reporting

S.38 The WHS Act requires that incidents resulting in death, serious injury or illness or the potential for serious injury are reported to the regulator. The notification must be given by telephone or in writing. Any` written notice must be in a form, or contain the details, approved by the regulator and can be given by facsimile, email or other electronic means.

Aside from statutory requirements, prompt reporting of incidents enables the opportunity to review what went wrong and why. A simple procedure should be used, and appropriate records kept. Once reported, incidents should be investigated and immediate action taken to prevent future occurrences.

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5. COUPE/HARVESTING SITE ACCESS AND PREPARATION

5.1 Roads

Construction work

The definition of construction work in the WHS Regulations includes any work carried out in connection with the construction, repair or maintenance of a roadway or pathway.

The construction of access roads to logging coupes or harvesting sites that involve major earthworks is considered construction work and the requirements of the WHS Regulations for construction work will apply.

Activities such as clearing vegetation from existing tracks and landings are not intended to be construction work.

In the road construction stage, a contractor involved with these works should:

- check the initial road construction plan and take action to remove hazards from road, bridge and log landing construction areas
- remove all hazardous trees within 2 tree lengths of the construction area
- where road lines are not harvested prior to road construction, make sure any trees felled or pushed are clear of any standing trees and left in a safe position
- mark or tape any dangerous areas or trees.

All construction operations should be carried out using safe systems of work and allow all road users and adjoining landowners to pass safely through and around the road works.

Further information on traffic management is available in the [draft] *Code of Practice: Traffic Management*.

Further guidance on construction work is provided in the *Code of Practice: Construction Work*.

Use of explosives

Where explosives are planned to be used for blasting operations associated with road or log landing construction, a competent person experienced in the controlled application of explosives should be consulted before deciding whether explosives may be used for the work.

The possession, storage, handling and use of explosives must be carried out in compliance with the relevant dangerous substances/goods or explosives legislation applicable in your state or territory.

The transport of explosives must be in accordance with the *Australian Code for the Transport of Explosives by Road and Rail*.

If explosives are used in forestry operations, a licensed competent person must be engaged to undertake the work, develop the blast management plan and be responsible for all aspects of the use of explosives for the work that is to be carried out.

For further information on the use of explosives, refer to *AS 2187.2: Use of explosives*.

Maintenance

Unsealed road surfaces exposed to rain and traffic can deteriorate and impact on the safety of the road user. Maintenance should be carried out when necessary to ensure a reasonable quality of road surface and control the risk to vehicles and users.

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During future maintenance or when harvesting operations are adjacent to roads used by other people, the land owner or forest manager/principal contractor should establish traffic control where necessary and should erect signs warning of the tree felling activities.

5.2 Bridges

The following control measures should be implemented when constructing bridges for forestry operations:

- equipment used should be of adequate capacity to handle materials used in bridge work
- bridges must be adequate to carry intended loads
- a safe working area should be provided to process the materials used in bridge construction
- any prefabricated scaffolding used during bridge construction or maintenance requires design registration under the plant regulations.
- floatation devices should be worn when working over water
- all persons should be clear of the 'slew area' of materials handling equipment and overhead movement of materials no person is to be suspended from any equipment unless in an approved 'personnel cage'

5.3 Log Landings

The design and preparation of log landing areas should make the work area as safe as possible by reducing the risk from surrounding trees and the interaction of workers and machinery. The design of log landing areas should take the following factors into account:

- location of an area as flat as reasonably practicable to allow for water run off
- clearance from any power lines
- all hazardous trees are felled within 2 tree lengths of the landing
- suitable space for parking mobile plant, for truck entry and exit, and for turning and manoeuvring trucks
- permit the safe passage of other traffic which may need to pass the operation
- a safe designated location for truck drivers during loading operations
- a suitable location for a rest area and a place to park vehicles
- safe pedestrian access
- suitable separation distances between major activities such as loading, stacking measuring and entry of snigging tracks (a track along which logs are pulled from the felling point to a nearby landing)
- suitable space for undertaking machine inspection and maintenance
- space for the number of products to be stored, loaded and the volumes of wood to be handled
- space for storing fuel (dangerous goods).

For information on the design of landings for cable harvesting operations, refer to the *Guide for Managing Risks of Cable Logging* [under development].

5.4 Safety signage

Safety signs should be clearly legible and placed in positions which will give adequate warning of the operations to any persons approaching or using the road tracks in the area.

Signs should be placed at each entrance to a work area and at the entrance to an area of intense activity (such as a landing), in order to:

- exclude unauthorised people

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- notify authorised people about
  - the PPE required
  - how to communicate with the harvesting crew
- provide visitors with directions to an appropriate location, and if necessary, contact details of the appropriate personnel in the crew (e.g. the harvesting team leader).

Where tree felling is in progress, “Tree Felling in Operation” signs should be displayed. These signs should be displayed in a prominent location at all entry points to a coupe.

As a recommended minimum, such signs should read *‘Danger – Tree Felling Ahead’*, or *‘Danger – Forest Operations Ahead’* (see Figure 5).

Figure 5 – Examples of suitable tree felling signs

Other signage could include:

- ‘road closed’ signage
- Traffic control signage
- ‘Log trucks entering’ signage
- UHF frequency and other communications signage.

5.5 Visitor control

It is a requirement under the WHS Act to protect not only workers but also others that may be affected by the conduct of the business or undertaking. This highlights the need to have arrangements in place to manage visitors to the work area and road traffic on roads adjacent to forestry operations.

Appropriate signage should be displayed at each forest operation indicating that forestry operations are underway, safety equipment is required and visitor control procedures/induction are in place to ensure visitors are under the effective control of the site supervisor.

It should be assumed that visitors to the site are unaware of the hazards of the forest operations. The site supervisor is responsible for ensuring that visitors understand and comply with safe work procedures and wear the required personal protective equipment.

5.6 Unauthorised entry to coupe/harvesting sites

In some jurisdictions, the police and certain government agencies have the power to remove people who invade forest operational areas. In preparation for an invasion occurring, contractors should be made aware of the requirements to:

- cease activities
- secure the site and equipment
- request people leave, if safe to do so
- contact the relevant authorities

- collect any relevant information
- inspect the site and equipment to ensure persons are not at risk before recommencing work.

6. TIMBER HARVESTING

The changing nature of the forest environment requires operators to identify hazards and implement control measures so that timber can be safely harvested. Risk assessments of work areas and individual trees should be carried out on an ongoing basis to ensure that control measures are still appropriate.

6.1 Hazardous trees

Hazardous trees are not only defined by the overhead hazards (such as hung-up trees, widow-makers) but also by their characteristics and location. Dead or hazardous standing trees pose a higher risk of falling debris and may also fall unexpectedly. The safe felling of hazardous trees requires all risk factors to be identified and appropriate methods, whether manual or mechanical, selected to provide the highest level of protection for the feller.

An accredited feller is not obliged to fell a hazardous tree that he/she considers to be beyond their competency to fell safely.

Damage to trees caused by recent fires, wind, snow or insects may mean that all trees in an area are hazardous.

High-risk forest activity	**Felling hazardous trees**

Common Hazards – associated with felling hazardous trees

Identify these features of hazardous trees:

- Widow makers (branches hanging in the tree's crown)
- Excessive rot content in the tree, including any dry sides, scars or hollows
- Burn out of the tree butt
- Burnt out limb, which may cause it to fall
- Another tree lodged in the tree
- Vines connecting the tree being felled to other trees or the ground
- Tree trunk with substantial damage
- Defective tree located less than two times its length away from the tree to be felled
- Storm or snow damaged tree
- Tree's root system likely to uproot due to its location (slope, wet area)
- Trees with exposed root systems
- Trees with excessive lean
- Trees larger than the capacity of the felling machine
- Thick undergrowth located at the tree base which cannot be cleared
- Interlocking limbs
- Location which restricts feller's safe movements (rocks, steep banks, road fill,etc)
- Inadequate condition of wood fibre to ensure safe directional control of the falling tree
- Dead trees
- Trees with burnt out sections
- Burning trees.

These factors can be exacerbated by high winds, periods of drought, recent isolation or dead limbs drying out.

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Risk Controls - The recommended process for felling hazardous trees

1. Identify hazardous trees by referring to features in previous checklist

2. Prohibit work near the hazardous tree

If the tree is assessed as being too high risk to fell:

Clearly identify the tree without placing yourself or others at risk, e.g. mark the hazardous tree using log marking paint, tape the area of the coupe/harvesting site using highly visible log marking tape, or record the location on the coupe/harvesting site plan.

No work should be carried out in the hazardous zone until the tree is brought down. The 'hazardous zone' is:

- 2 tree lengths from the hazardous tree, or
- 2 crown widths when broken limbs are hung up in trees.

3. Selection of mechanical equipment to remove hazardous trees

If the hazardous tree is assessed as being high risk, first consider using mechanical equipment as the preferred felling method:

- Use a harvester, dozer, excavator or skidder with an appropriate protective structure to remove the tree.
- Use a person who has the appropriate experience and the required licenses and/or permits to use blasting explosives to remove the tree.

4. Manual felling identified as an alternative safe felling method

Where the risk is assessed as being manageable by manual felling techniques, the system of work must have the following minimum risk control measures:

- The felling should only be done by a feller assessed as competent against the relevant national unit of competency for the manual harvesting of trees and have current industry experience
- Maintain the separation distance of 2 tree lengths to other workers
- Use a recognised safe felling method (refer to **AS2727 – '***Chainsaws – Guide to safe working practices'*). It is permissible for a hand feller to place preliminary cuts in the tree prior to another machine pushing the tree. If widow makers or brittle tops have been identified, the feller must work under a suitable protective structure
- Ensure the area around the base of the tree is scrubbed mechanically and suitable escape routes are in place
- Radio communications must be maintained between all operators

Note: At no time should the practice known as 'driving trees', that is, felling a second tree into another tree in order to bring down the first tree, be undertaken.

Specific fire salvage risks		
High risk	**Reduced risk solution**	**Preferred solution**
Manual felling of fire damaged trees: • Limbs falling • Burnt out butts • Interlocked limbs Where it is observed that brown leaves have fallen from limbs, this will trigger the need to reassess an alternative felling method	• Manual felling for hazardous trees (see item No. 4 in the previous table) • Daily harvesting contractor pre-start check to ensure no limbs are falling before manual harvesting starts • Regular risk assessments conducted by principal contractor and harvesting contractor/manual feller to monitor controls and confirm the state of trees as the timber dries out during the harvesting operation	Mechanical harvesting for hazardous trees (see item No. 3 in the previous table)

6.2 Manual felling

Manual felling is undertaken in an environment in which there are a number of common hazards.

In addition to these common hazards, safe manual felling requires the application of specific risk controls depending on the circumstances of the work area.

Many of the hazards that affect hand fellers are also hazards for others working in the forest, particularly anyone working outside of a protective canopy.

High-risk forest activity	Manual felling

Common Hazards - associated with manual felling:
• Unsuitable ground conditions and slope • Falling objects such as limbs, dry stags, dead and brittle tops and widow makers • Standing vegetation in the intended direction of fall • Being struck by the butt of the tree • Kickback or recoil from the chainsaw • Hazardous trees as set out in Section 6.1 • Weather conditions including heat, wind, rain and cold • Fatigue.

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Risk Controls - The recommended process for manual falling:
1. Assess trees as safe to fall • Identify all hazardous trees (refer to Section 6.1) • Use mechanical assistance for trees with excessive lean, where practicable • Ongoing check for hazards (especially overhead) and changing conditions • Cease operation in high winds
2. Maintain suitable separation distances from other operators • Maintain the separation distance of 2 tree lengths • On steep ground where there is a risk of felled trees sliding downhill after felling, ensure no one is working below the tree feller • Maintain radio communication with other forest workers • Use signage and traffic management where work area is close to roads • Close roads as required
3. Ensure adequate escape routes • Where escape routes are impeded by undergrowth, remove material around the base of the tree using the blade of a dozer or skidder, prior to felling • The 45-degree escape route (see Figure 6.1) should extend to an area at least 6 metres away from the stump
4. Reduce risks from elevated hazards • Fell trees into an open area – no standing woody vegetation in the direction of fall – and ensure that falling trees do not strike brush or other standing vegetation as they fall • Avoid using wedges where there is a chance that limbs may be dislodged • Where the tree is assessed as hazardous, apply the practices described in Section 6.1 • Consistently apply appropriate felling methods (refer to AS 2727)
5. Use chainsaw safely • Follow safe work practices. (Also see Figures 6.1 and 6.2) • Maintain safety features of chainsaw including hand guard and chain brake • Carry appropriate fellers equipment including an axe; lifting and holding wedges suitable for the trees to be felled; a two-way radio voice communication device; one No. 15 wound dressing, and chainsaw fuel and oil in an approved manner. • Must use suitable, well-maintained PPE – for example a hard hat with hearing protection, eye protection, high visibility clothing, safety footwear and leg protection. PPE must be reasonably comfortable for the wearer, for example leg protection may not be comfortable in hot or humid conditions.

Accepted felling methods

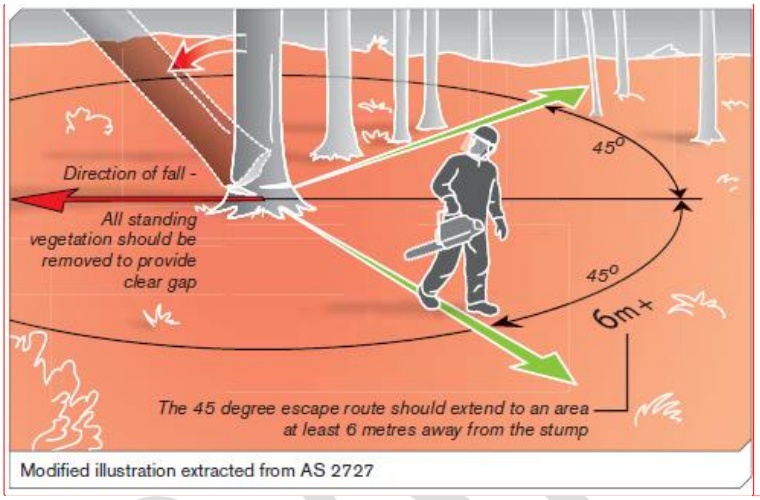
Information on manual tree felling techniques can be referenced from relevant chainsaw operators' manuals and AS 2727 – '*Chainsaws – Guide to safe working practices*'. .

Except for heavy forward leaning trees, a suitable holding wedge must be inserted into the back cut of each tree that is manually felled with a chainsaw.

If a tree does sit back due to unforeseen circumstances, the tree feller should abide by a safe system of work in accordance with the procedures as detailed in Appendix D.

Figure 6.1

Risk Controls - Escape route and direction of felling

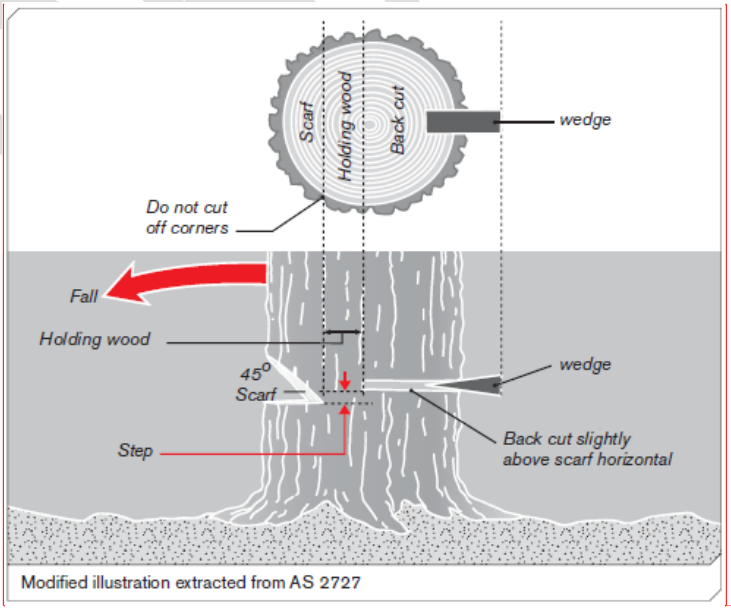

Direction of fall -
All standing vegetation should be removed to provide clear gap
45°
45°
6m+
The 45 degree escape route should extend to an area at least 6 metres away from the stump

Modified illustration extracted from AS 2727

Comment [U12]: Whilst I note that this illustration is modified and extracted from the Australian Standard, I put forward a few points.
1. It is not always reasonable to remove *all* standing vegetation, except on the elected escape route.
2. I do not believe the diagram is clear enough as the location of the safe zone. It is generally considered to be between 90 degrees and 45 degrees to the rear of direction of fall.
I can interpret from this picture the safe zone to be anywhere within the 90 degree region in the green - and that is not correct.
I would be pleased to discuss these points in more detail.

Figure 6.2

Tree felling



Modified illustration extracted from AS 2727

Comment [U13]: The basics of this diagram are correct.
1. Safe practice, even for experienced fallers is to have a step of the back cut to be more "significant" than "slight".
I recommend removal of the word "slightly above", and just have it as "above".
I would be pleased to discuss these points in more detail.

Thinning

Thinning is a selective felling operation that may comprise of one of the following:

- thinning to waste – normally work carried out in young crops to improve the quality of the stand
- thinning for extraction of small piece size material for posts or pulp
- thinning for saw log and small produce
- thinning for stand improvement.

The safety procedures for thinning operations is similar to that for felling other trees, however the following safeguards should also be observed by all persons engaged in thinning operations.

Additional Risk Controls - Recommended safety procedures for thinning operations:
1. Identify hazardous trees by referring to features in the previous *'hazardous tree'* checklist
2. Fellers are to keep watch on the falling tree and keep a sharp lookout for limbs and branches that may be thrown back
3. Fellers are to be aware of dead or otherwise defective trees
4. Fell or otherwise remove any dead or defective tree that may be positioned in the intended direction of fall before commencing thinning operations
5. Hung up trees to be brought to the ground • Where a tree is hung up, it should be brought to the ground as soon as possible • The feller should not leave the area until the tree has been grounded, other than to seek assistance. Before leaving to seek assistance, the feller should make all other persons in the immediate area aware of the danger • The person in charge of the thinning operation should be advised whenever a tree cannot be completely felled so that appropriate action can be taken to bring it to the ground safely.

6.3 Machine-assisted manual tree felling

Machine-assisted manual tree felling, must only be carried out by an operator with relevant training and experience.

Before starting any machine-assisted manual tree felling operation, all persons involved should have been consulted and informed on the operation to be carried out and have agreed on the risk control measures and sequence of events.

The consultation should include an assessment of the tree to be felled and surrounding trees for any visible hazards that may present an unacceptable risk. In any machine-assisted tree felling operation the person on the ground (feller) must always have control of the felling operation and have radio contact with the excavator operator.

Equipment

Any machine used in such an operation must have an operator protective and falling object protective structure, suitable for forest operations (see Section 4.6), have sufficient height reach, and is able to control the felling direction of the tree in a safe manner.

The machine operator should ensure that the machine has the capacity to push the tree in a safe manner.

The machine operator should clear the under-storey from around the tree and create a safe footing for the manual faller to work on. All hazardous trees should also be cleared from within two tree lengths of the tree to be felled.

The felling operation

Where an excavator or other mobile plant is to be used to push the tree in a direction other than its natural lean, the machine should be placed in position before the tree feller approaches the tree.

The log grab fitted to the dipper arm or the tree pushing attachment should be in contact with the trunk of the tree with only sufficient push force applied to prevent the tree sitting back during the felling operation.

The attachment should be at a height above the ground sufficient to enable the excavator to provide an adequate force to push the tree after the felling cuts have been made.

When the excavator is in position, the controls should be isolated to prevent any unexpected movement of the machine or attachments.

Once the excavator or other mobile plant is in position with its controls isolated, the tree feller may approach and place the scarf cuts. The depth of the scarf should not exceed one half of the diameter of the tree.

After the scarf has been removed the feller should place a back cut in the tree but leave sufficient even holding wood to prevent any backward movement of the tree.

At no time while the back cut is being placed should the machine operator apply additional force to the trunk of the tree, unless directed to do so by the feller, as this may result in the tree splitting and capping up.

Once the scarf cuts and the back cut have been completed, the tree feller should leave the area by the safest route to a pre-determined safe zone as determined by himself and the machine operator.

The machine operator may then apply a steady controlled push until the tree is committed to fall.

If the tree will not fall, the excavator operator should isolate the controls with the attachment still in contact with the tree trunk and ask the feller by radio to return to the tree and remove more hinge wood.

Once the tree feller has removed additional hinge wood, the tree feller should again retreat to the safe area before the machine operator attempts to push the tree again.

The feller is to ensure that the width of the hinge wood is not reduced below 5% of the diameter of the tree.

If the hinge wood has been progressively reduced to 5% and the tree will still not fall, the faller is to stop the operation and a person in charge should assess the risk of continuing.

6.4 Mechanical felling

Many of the hazards identified for manual felling also apply to mechanical harvesting, however risks to the machine operator are reduced by the protection provided by the machine. Machines used for mechanical felling include custom-built feller-benchers, single grip harvesters and processors and excavator-type machines with after-market felling heads.

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Mechanical felling

Common Hazards - associated with mechanical felling:

- Limbs left hanging in retained trees
- Vines connecting the tree being felled to other trees or the ground
- High winds that effect the direction of fall
- Dead or partially dead trees
- Tree felled into working area of other workers
- Machine not suitable for slope and terrain – risk of rollover
- Ground workers crushed or struck by mobile plant
- Slips, strains and falls getting in and out of machine
- Mechanical harvester selected not suitable to harvest tree size in coupe/harvesting site
- Poor visibility to observe overhead hazards
- Loose objects in the cabin
- Falling objects that can penetrate or crush cabin space.

Risk Controls - The recommended process for mechanical felling:

- Mechanical harvester of suitable weight and power for coupe/harvesting site conditions and tree size
- Operator trained in working limits of machine and techniques for different trees and ground conditions
- Cab visibility that allows ongoing check for hazards (especially overhead) and changing conditions.
- Operator carries out risk assessment of felling area to determine that risks are manageable (e.g. rock, slope, hollows)
- Oral, visual and/or radio communications with other forest workers
- Operation within an agreed safe work area (usually at least 2 tree lengths separation)
- Suitable operator protective structure given the size of the trees being felled
- Appropriately placed handrails and steps
- Operator seat and seatbelt used and maintained
- Use of suitable, maintained PPE - high visibility clothing, safety footwear, hearing protection, safety helmet when outside the cabin and gloves when handling fuels or sharpening chains

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Specific mechanical harvesting risks and preferred solutions

High risk	Reduced risk solution	Preferred solution
Chain breaks—possible exposure to chain shot.	No interim solutions	• Install chain shot guard. • Sufficiently reinforced windscreen that is adequate for the hazards involved. (This is preferably of polycarbonate construction as laminated glass will permit penetration and is therefore not suitable). • Never use the saw so that the saw bar is directly in line with the cab or other people (preferably directed at unoccupied section of plant). • Inspect cutting equipment daily. • Replace chain when required, and per manufacturer specification or better. • Keep ground workers at least 70 metres away from a working harvester/processor or to manufacturers specified safe working distance, whichever is the greater.
Maintenance (such as greasing) of harvester head while the engine is running	No interim solutions	Complete shutdown and isolation of machinery while doing maintenance such as greasing and changing chainsaw bars and chains.
Falling trees beyond the machine's capability as specified by the manufacturer	No interim solutions	Must not be carried out.
Machine instability during felling	• Ensure harvesting attachment is properly clamped to tree. • Do not overreach with boom. • Place machine straight up and down slope	• If lean of tree and slope is beyond the specified machine capability, leave for hand falling. • Do not fall if wind conditions make direction of fall unpredictable.
Felling near overhead power lines	• Work at least two tree lengths away from power lines. • Only fall trees in parallel or away from power lines	• Liaise with power companies to switch power off as necessary.
Patches of rock, vines, dead trees and tunnel erosion within steep and dense areas	• High risk areas marked on harvest planning map based on aerial photographs, historical records etc	• Forest owner or operator should walk area prior to starting work to identify high risk areas and adjust or select harvesting techniques to suit. • High risk areas should be recorded on the planning map for the benefit of the next rotation.

7. LOG EXTRACTION

Extraction includes forwarding, skidding, snigging, shovel logging and cable logging. Each activity has exposure to the common hazards of falling objects, roll-over of mobile plant and working too close to other operators. Each method of log extraction has specific hazards but the following are common to all extraction methods.

High-risk forest activity	Log extraction

Common Hazards - associated with log extraction:

- Being struck by rope wire sprags and equipment failure
- Instability of machine and risk of rollover or sliding of skidder or dozer
- Being struck by rolling logs/debris escaping from landing chute in cable logging
- Being struck by falling objects such as limbs, dry stags, dead and brittle tops and widow makers that fall as a result of harvesting or extraction activity
- Contact of the skidder or dozer with other plant or people in the work area
- Slips, strains and falls getting in and out of the machine.

Risk Controls – recommended process for log extraction:

- Use of a machine fitted with a grapple
- Use of machinery suitable for task and terrain
- Use of suitable mechanical equipment with canopy protection
- Operator trained in working limits of machine and techniques for snigging
- Oral, visual and/or radio communications with other forest workers
- Operation within a safe work area (2 tree lengths separation)
- Approach and choke logs from high side
- Appropriately placed handrails and steps on machinery
- Use of suitable PPE—high visibility clothing, safety footwear, hearing protection, safety helmet when outside cabin and gloves when handling fuels or cables.

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High-risk forest activity | **Extracting logs on steep ground**

Risk Controls - The recommended process for extracting logs on steep ground:

1. Selection of suitable machines

- The machine should be assessed as suitable for the terrain, slope, weather, log size and task before work commences
- The machine must be fitted with a protective canopy (Falling Objects Protective Structure) that is appropriate for the identified hazards, and Roll Over Protective Structure that is appropriate for the given slope and terrain
- Seatbelts must be fitted and worn
- The machine should be operated within the manufacturer's specifications.

2. Maintain standard precautions

- Conduct machine inspections before operation
- Assess coupe/harvesting site for rock, slope and other ground related hazards prior to operation
- Maintain safe work areas and procedures, where entry into another work area only occurs with permission of the other operator
- Maintain visual, oral and/or radio communication with other workers
- Check for overhead hazards before dismounting
- The skidder or dozer operator must wear safety footwear and high visibility clothing at all times, and a safety helmet when outside the cabin
- Ensure noise levels are checked and hearing protection is worn as necessary
- Ensure there are no loose objects inside the cabin of the machine.

3. Specific measures to prevent instability or rollover on steep ground

Forwarders

- The loader or carrier should never be loaded in excess of the manufacturer's specifications or loaded above the level of the headboard or stanchions
- Stanchions must not be extended without the manufacturer's authorisation
- Drag logs closer to forwarder before lifting
- Load topside of cart or truck first
- Do not overload grapple
- Do not overload log bunk
- When loading on sloping ground, park straight up or down the slope
- Logs being loaded in the loader should be fully encircled by the holding jaws when the jaws are closed

Snigging with skidder or dozer with winch or grapple

- Extraction of logs must not be undertaken on gradients or side slopes that exceed those specified by the equipment designer, manufacturer, importer or supplier.
- When snigging heavy logs downhill, hook up "short" and low to the ground to avoid logs overtaking the skidder or dozer
- When snigging heavy logs uphill, raise the log and if necessary use a series of "winch—move forward—winch again" moves
- Avoid turning the machine on a slope
- Avoid travelling across side slopes in excess of manufacturers specifications.

Using winch

- When travelling downhill, keep the winch rope taut so the snig will not bump or pass the rear of the machine
- Avoid winching logs at a sharp angle to minimise rollover hazard.

Shovel logging

- When working on a slope, keep the grab as low as possible
- When travelling on a downhill slope, keep the boom facing downhill
- When travelling uphill, keep the boom facing uphill in a fully extended position with the grab as low as possible
- Do not shovel logs towards or onto a live landing
- Test loads before extending boom to ensure the machine remains stable during load movement
- Avoid turning the machine on a slope
- Avoid travelling across side slopes
- If travelling across side slopes is unavoidable, keep the boom facing downhill
- Where practical, always work on slopes with tracks facing up and down the hill
- If the machine starts to tip or slide, lower the boom immediately in a controlled manner.

7.1 Delimbing

There are a number of hazards related to the preparation of logs for extraction. These are in addition to the common hazards of falling objects, contact with mobile plant and kickback from chainsaws.

Workers should approach all branches with caution, examine the branch to see if it is under tension, up or down or bent sideways, and then determine the correct method of work.

Risk Controls - The recommended process for delimbing:

- Delimbing and crosscutting should be undertaken at least two tree lengths away from felling operations, or separated by time
- Trees should be assessed for risk of rolling, dropping or swinging when cut
- De-limbing or cross cutting should not be carried out from the downhill side of the log if the log has the potential to roll
- Overhung or suspended logs should only be cut using recommended methods (e.g. *AS 2727 – 1997 Chainsaws – Guide to safe working practices*)
- Logs suspended above shoulder height should not be crosscut
- In steep or undulating terrain, the crosscutter should not work immediately above or below operations or people
- Workers should approach all branches with caution, and examine the branch to determine if it is under tension
- Watch for trapped or springy saplings
- Wherever practicable, standing on the log should be avoided when delimbing or cross cutting

8. LOG LANDINGS

The log landing brings together ground workers and machine operations and creates risks that should be carefully managed. Initial planning of the log landing and workflows will minimise problems (see section 5.3). For example, the landing design should have road widths suitable for the type of trucks and volume of traffic.

The set up of the landing can increase productivity and reduce risks by using practices such as stacking the most commonly loaded product closest to loader. Protection of other workers (e.g. log graders) can include measures such as leaving non-hazardous trees on the high side of the measuring area to protect the work area.

Work practices of operators entering the area need to account for the presence of others. For example, safe systems of work should be implemented to ensure that:

- skidders do not enter the landing area until it is safe to do so
- skidder operators should communicate with landing workers, reduce speed when entering the landing, and ensure that logs are fully dropped before unhooking
- logs should only be approached after they have been completely landed and, if necessary, stabilised
- machine operators are not to carry logs over ground crew
- workers are not exposed to hazards from moving logs by working in front of, climbing onto or working on logs placed in log stacks or dumps and
- chainsaws are not to be used to cut logs on a log truck.

Logs should be stacked on firm, level ground or a sound base, and stacks should be made and maintained in a stable condition. Log stacks should not exceed a safe working height that can be handled by the log handling equipment.

8.1 Log preparation

Debarking should be undertaken following the same work area rules for all log landing operations (i.e. away from the swing path of loader boom).

Log preparation may be undertaken in the forest or at a landing by:

- Custom built processors in cut-to-length operations,
- Excavators fitted with an aftermarket cut-off saw;
- Cross-cutting by hand.

Where a chainsaw is fitted to a machine and used for log preparation, refer to section 7.3 to reduce the risk of injury from chain shot. Where chainsaws are used, the techniques described in AS 2727 should be used and logs should be secured before cutting.

Log marking is usually undertaken for the purpose of identifying contractors and logs to an end market. The requirement to mark every log can be reduced if logs are sold by weight. In doing so, the risk of log markers being struck or crushed is reduced.

8.2 Log Measurement

In situations where logs are sold by volume, the following safe system of work should be applied to log measurement:

- Assess all risks to personnel and equipment before commencing any measuring operation
- Locate the log in a designated area away from any other working operation
- Position the log in a safe manner for measuring (e.g. on a notched log)
- Inspect the log to ensure that it is adequately choked to prevent it rolling or sliding
- Place the tape around the centre of the log and do not position yourself under the log at any time

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- Measure the length of the log by hooking the tape on lower end of log and read from raised end, and
- Brand the raised end of the log ensuring that there is sufficient space to swing the hammer.

High-risk forest activity	Cross-cutting, measuring, marking or checking logs outside a machine canopy at a log landing or roadside log dump

Common Hazards - associated with ground worker tasks outside a machine canopy:

- Falling limbs or trees;
- Moving machines;
- Rolling or sliding logs;
- Chain-shot or other material thrown by machines working on landing;
- Slips and trips;
- Dermal exposure to hazardous substances

Risk Controls - The recommended process for ground worker tasks outside a machine canopy:

1. Establish pattern of work that separates activities as far as possible

- Display warning signs at entry to site
- Where practical, ensure there is a physical barrier (e.g. log stack, another machine) between machines and ground workers
- Ensure with chainsaw use that the line of cut is never directed at ground workers
- Ensure no-one enters the area within the full swing radius plus half the log length in the beak, or the manufacturer's specified safe working distance (whichever is greater), while any machine is handling logs
- Ensure the intended path of travel for skidders and forwarders is clear of ground workers
- Ensure all machine implements are grounded when the machine is parked
- No log is to be swung above or within reach of ground workers
- No worker is permitted to walk under an implement that is supported only by the machines hydraulics
- Ensure log marking paint is used in accordance with the Safety Data Sheet.

2. Reduce the chance of logs rolling or falling

- Ensure there is adequate separation between stacks and machines to minimise the risk of disturbing any stacked logs
- Log stacks should be kept to a safe height on level ground and angled to maximise stability
- Logs stacks should not exceed a height greater than the capacity of the log handling equipment
- Avoid working at the base and downhill side of a log stack
- Logs should be positioned on notched logs for manual cross-cutting
- Work on the topside of a log when manually cross-cutting, grading or measuring.

3. Reduce the chance of slips, trips and falls

- Assess the work area for uneven surfaces and high edges, and identify appropriate controls
- Ensure bark and other debris is regularly removed from the work area of ground workers

- On corded landings, do not walk on corded area while machines are operating
- Arrange the work area so that the ends of logs can be marked or painted while standing on the ground
- Ensure safety footwear is in good condition and do not have worn soles
- Use handrails and steps when stepping down from a machine.

4. Maintain communication with other operators

- Use radio communications to monitor movement on the landing. Any entry into a designated work area must be with the permission of the area controller.

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9. LOADING, TRANSPORT and UNLOADING of LOGS

9.1 Loading and unloading of logs

The loading and unloading of logs may be undertaken on landings or at roadside log dumps where the workers loading trucks often work for a different organisation to the workers driving trucks. It is important to implement ways of communicating hazards and safe systems of work between workers from different organisations.

High-risk forest activity	Loading, transporting and unloading logs

Common Hazards - associated with loading, transport and unloading of logs:

- Driver being struck by falling, rolling or sliding logs
- Rollover of log truck due to the high load or load movement
- Working alone
- Loads with extreme overhang
- Slips, strains and falls getting in and out of machine, or checking load
- Other road users struck by logs or other material falling off truck
- Struck by log when releasing dogs and chains
- Crushed or struck by logs
- Back strain from throwing chains to secure load
- Logs moving in transit creating risk to driver when unloading.

Risk Controls - The recommended process for loading, transport and unloading logs:

1. Remain in the safe area at the log landing while loading (see Figure 10.1)

- The driver must remain in a pre-arranged location outside the work area of the loading machine, preferably in the loader's line of sight in front of the truck
- Logs must not be lifted over the truck cabin
- Ensure no one enters an area described by the full swing radius plus half the log length in the beak, while any machine is handling logs
- No person should leave the safe area and enter an area described by the full swing radius plus half the log length in the beak until the loading operator has given permission and the loading machine's beak is placed on the ground
- The driver must wear PPE including high visibility clothing, safety footwear and a safety helmet while outside cabin
- The driver must not stand or sit on any exterior part of the truck or load during loading
- Oral, visual and compatible radio communication between the driver and machine operators must be established and confirmed
- If the driver is required to wait during loading, adequate shelter and amenities should be provided.

2. Load safely

- Machines selected for use must be designed and appropriate to lift the logs to be handled
- The loader operator should hold the appropriate competency
- When working alone a system must exist to monitor the condition of the operator.

The recommended process for loading, transport and unloading of logs (continued):

3. Safely marking saw logs

- When marking sawlogs, stay in your work area and out of the machine's work area until the load is grounded and stable and the operator has given you permission to enter
- You should give the machine operator permission to recommence operation after you have returned to your work area and are out of the machine's work area.

4. Safely secure the load

- Do not enter the machine's work area until the operator has given you permission
- Do not lash or unlash any bay while another bay is being loaded or unloaded
- Ensure all load binding equipment (e.g .chains, webbing and tensioners) are in good working order before use
- Visually check the load for stability and security prior to placing any load lashings
- All log loads must be restrained by lashings of adequate lashing capacity for that particular load weight and secured in a way that will comply with the National Load Restraint Performance measures, contained in the guidelines and road regulations
- Outer logs must be secured by at least 2 lashings
- Short logs must be cradled between longer logs
- Ensure that the load is crowned ensuring that the load lashing contacts all logs on the outside of the load
- A minimum distance of 300 mm between the end of a log and a load restraint device (stanchion or lashing) should be maintained. (See Figure 9.3)

5. Check the load in transit

- The load and load lashings should be manually checked shortly after leaving the landing or loading site
- Use appropriately placed handrails and steps
- Visually check the load lashings regularly while in transit regardless of whether they self-tension or not.

6. Observe road rules (including mass, dimension and load restraint requirements)

- Exit the coupe/harvesting site at speeds prescribed or consistent with road conditions
- Be aware of other road users when exiting the coupe/harvesting site
- Comply with relevant road rules
- Be aware that log transport vehicles generally have a high centre of gravity and can roll over more easily than other types of general goods vehicles at roundabouts and off-ramps.

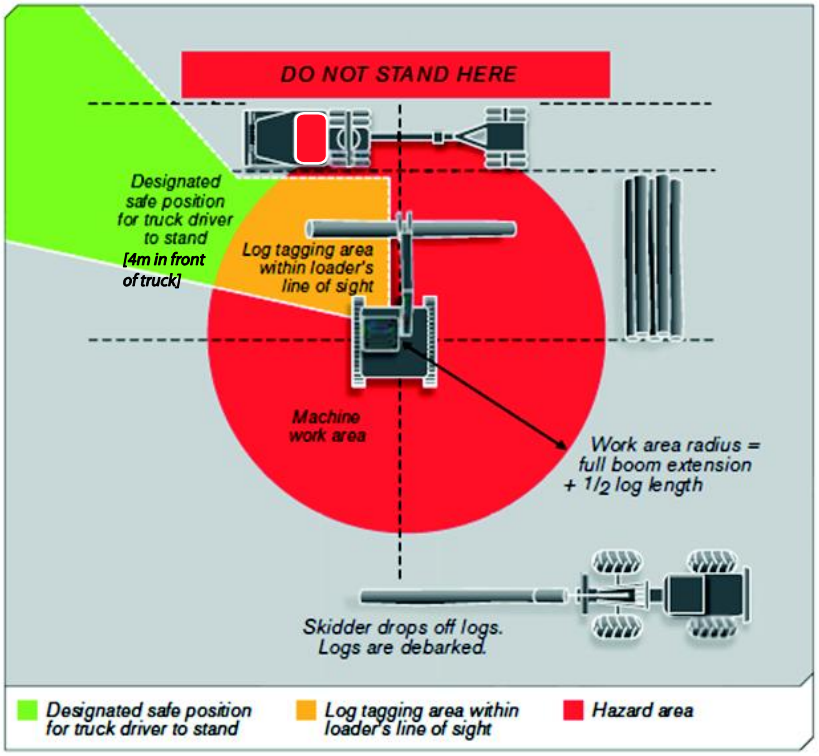
7. Unload safely

- Before unloading, the driver should inspect the load for signs of possible movement
- The unloading facility must secure logs on top of the load prior to the driver removing the load binders.
- The driver should step back from the load after binders have been released and watch the top of the load
- If using chain lashings, consider an alternative to an over-centre lever style load binder (dog). Consider using a turnbuckle tensioner or another type of non-rebounding tensioner. Extension bars used to obtain increased tension are dangerous as they can rebound quickly during tightening and releasing resulting in a risk of striking workers.
- Machines used to unload trucks must be specifically designed to lift the logs they handle over the top of pins and stanchions

- The driver must remain in a pre-arranged location outside the work area of the unloading machine, preferably in front of the truck as depicted in Figure 9.2
- If drivers need to wait during the unloading process, adequate shelter and amenities should be provided.

Figure 9.1

This is an example of a safe work area in a hardwood log landing situation.


DO NOT STAND HERE
Designated safe position for truck driver to stand [4m in front of truck]
Log tagging area within loader's line of sight
Machine work area
Work area radius = full boom extension + 1/2 log length
Skidder drops off logs. Logs are debarked.
Designated safe position for truck driver to stand
Log tagging area within loader's line of sight
Hazard area

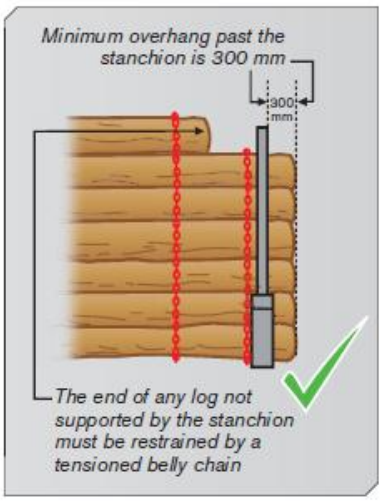
In this case, the work area for the log loader is shown as the area described by the boom length plus a half log length (red). The person who needs to be protected in this situation is the truck driver who has a designated place to stand (green) that is outside the work area and within the loader operator's line of sight. Log tagging must also be conducted within the loader operator's line of sight, and only when the boom and log are grounded, the machine operator controls are isolated to prevent accidental movement and permission has been granted by the loader operator to enter the log tagging area (orange).

No one should enter the loader's work area or the log tagging area unless they have been given permission through UHF radio communication, and the log loader has stopped all movement. The loader must remain stopped once a person has been allowed to enter the work area. (Likewise, the operation must stop if an unauthorised person enters the work area.) If the loader operator is unsure about the safety of the work area, the operation must stop until the problem is rectified.

It is a key responsibility of contractors to establish these work areas and ensure separations are maintained. Work area separations must be adhered to by all workers as part of their duty to follow the safe work procedures of the business or undertaking.

Figure 9.2: An example of a designated safe work position for a truck driver in a softwood plantation situation is shown below. The driver is in front of truck cabin in view of loading operator.

Figure 9.3: Minimum distance of 300mm between the end of a log and a load restraint device (stanchion or lashing) should be maintained.


Minimum overhang past the stanchion is 300 mm
300 mm
The end of any log not supported by the stanchion must be restrained by a tensioned belly chain

9.2 Transport and load restraint

The maintenance, safe loading and operation of load-carrying vehicles used in forestry operations should be conducted in accordance with the requirements of the *National Load Restraint Guide – Guidelines and performance standards for the safe carriage of loads on road vehicles, National Transport Commission.*

All loads should be constructed and secured to the transporting vehicle in such a manner as to ensure compliance with the *National Load Restraint Guide.*

Approach to Landings

Trucks should not approach a landing when there is danger from incoming produce.

Moving Vehicles

Workers must always keep a safe distance from moving and loading vehicles.

Correct operation of vehicles

Drivers must:

- hold the legally required licence appropriate for the class of vehicle they are operating
- observe traffic regulations at all times
- have a thorough knowledge of the regulations and instructions for operating the particular class of vehicle they are driving
- check that the truck is loaded correctly and securely
- check that no person rides on any part of a log transport vehicle other than in the cabin.

Equipment to be fitted to trucks

All log trucks and trailers used for the transport of logs from the forest to the destination of the forest produce should be of appropriate design and construction for the safe transport of forest produce.

Trucks should also be equipped with suitable communication equipment.

Cab shielding (Guard)

All trucks transporting logs should be fitted with a cabin guard to protect the driver or passenger from the impact of a partial load from the rear loaded logs (see Figure 9.4).

The cabin guard should:

- be capable of restraining a load of 4000N applied horizontally at any point on the structure and distributed over the area of a 400 mm diameter circle
- be able to withstand wind forces generated when the vehicle is travelling at 100 Km/h
- be higher than the driver's cabin
- cover a cross sectional area of the maximum load carried on the log trailer assembly
- be capable of restraining logs with a minimum diameter of 110 mm
- be free from any protrusions that may penetrate the cabin if the guard fails and moves forward into contact with the rear of the driver's cabin.

Under normal operations the guard should be**:**

- mounted so that vibration generated by the transport vehicle cannot distort or damage the structure of the guard

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- constructed free of any sharp corners or edges which can result in injury to operators
- capable of withstanding inertia forces generated during vehicle braking
- securely fixed to the vehicle in the case of cabin and guard failure due to bending
- where practicable, fitted so that the guard is able to slew with the load, so that logs are prevented from moving past the cabin when the transport vehicle is driving through a sharp curve.

All design, manufacture and construction of the cab (shield) guard, should be undertaken by a competent person.

Figure 9.4 – Examples of cabin guards fitted to prime movers.

Rear load restraining guards

Rear load restraining guards (to prevent the release of logs from the rear of the load) must be fitted to log trucks where the rear bunk on the load is carrying debarked eucalypt plantation logs in short form. Where reasonably practicable, rear load restraining devices should be fitted to loads carrying debarked long length eucalypt tree farm logs.

Physical requirements
The rear guard should be:

- capable of restraining a load of 500N applied horizontally at any point on the structure and distributed over the area of a 400mm diameter circle;
- able to withstand wind forces generated when the vehicle is travelling at 100km/h;
- high enough to restrain all the logs
- capable of restraining logs with a minimum diameter of 110mm.

Operational requirements
Under normal operations the guard should:

- be mounted in such a manner that vibration generated by the transport vehicle cannot distort or damage the structure of the guard
- be free of any sharp corners or edges which can result in injury to operators
- be capable of withstanding inertia forces generated during vehicle braking.

Self-loading trucks

Self-loading trucks should be fitted with outriggers and stabilisers that firmly stabilise the unit while loading and unloading.

Further information on outriggers and stabilisers is available AS 1418.5 - *Mobile and vehicle loading cranes.*

All practical steps should be undertaken to protect the driver of a self-loading truck from log movements when he is operating the log-loading device. A positive means is to be provided to prevent a free fall of the boom in the event of malfunction. A safe means of access to the log loading position is to be provided.

Load configuration

The driver should ensure that the load is constructed so that:

- it meets the requirements of the National Load Restraint Guide and performance standards for the safe carriage of loads on road vehicles;
- where the load projects beyond the rear of the vehicle, a suitable reflective device should be attached
- no more than 50% of the end diameter of any log is to be above the top of the cab shield (guard) of the log truck
- outside logs that are in contact with the stanchion must have no part of that log above the height of the stanchion
- all loads should be crowned to ensure load security. The load should be secured within a reasonable distance of the landing and prior to leaving the coupe/harvesting site
- logs used to crown a load should have no part of the log more than 50% above the height of the stanchion
- outer ends of the outside logs should extend 300 mm beyond stanchions**.**

Load securing

The driver should ensure that:

- the load should be secured to the vehicle in accordance with the National Load Restraint Guide within a reasonable distance of the landing and prior to leaving the coupe/harvesting site
- both ends of all binders are located in the appropriate tensioning device before the tensioning of any one binder is carried out
- every bunk is restrained by at least two binders and every load is restrained by at least three binders on each load
- every log is restrained by a minimum of two load binders on each log, either directly by contact with the binder, or indirectly, if bound by surrounding logs
- short logs (<2.1m) should be secured in at least two places
- where practical a rear restraint device should be fitted to prevent logs sliding from the back of the load.

Load release and unloading (non sawmill sites)

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Unless using a de-twitching station, before load binders are released the loader operator should ensure that the load is adequately restrained to prevent any unexpected movement of the logs.

Any person, including a truck driver, working adjacent to a log truck unloading operation should place themselves at the front or at the rear of the vehicle and to either side and not closer than four (4) metres to the front or ten (10) metres to the rear of the vehicle in order to maintain eye contact with the loader operator or machine throughout the unloading operation.

Where a machine other than a winch is used to unload a vehicle, the binders are to be released from the unloading side, with the central binder removed first, followed by the rear binder and finally the front binder.

Where a winch is used to unload a vehicle, the binders are released from the opposite side of the vehicle to the unloading side, with the rearmost set of binders being removed first, then the next set until the foremost set is removed last.

The driver of a vehicle should not use a winch for unloading logs from the vehicle except when accompanied by another person.

Securing jinker or trailer

Where the driver of a vehicle returns with an empty vehicle with the jinker or trailer loaded on the vehicle in piggyback style, the driver should ensure that:

- the jinker or trailer is secured to the prime-mover or the forward trailer by a latching mechanism or a chain and load binder
- a safety chain or tensioned secondary latch is used between the jinker or trailer and the prime-mover or forward trailer
- all chains used to secure the jinker should be in accordance with the manufacturers recommendations.

Log restraining equipment

The owner of a vehicle that is used for transporting forest produce should provide and maintain load restraint equipment in good working order.

Bolsters

A bolster should:

- be of adequate size and strength to secure/support the load and
- be securely attached to the chassis members.

Chocks

A chock should:

- have a base of not less than 450 mm in length and
- be fastened to the bolster with not less than two chock pins, each of which is to be not less than 22 mm in diameter and drilled with a hole through which a retaining clip should be placed.

Stanchions

A stanchion should be securely attached and be of sufficient height to ensure that outside logs have their diameter below the top of the stanchion.

Stanchion extensions

Where stanchion extensions are used they should:

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- be approved by the manufacturer or a certified professional engineer
- be of adequate size and strength;
- be securely fastened to the bolster.

Chains and tensioners

If using chain lashings, consider using an alternative to an over-centre lever style load binder (a dog). Many workers find that they cannot get satisfactory chain tension when using a dog, and often use an extension bar to increase chain tension. Using an extension bar can be dangerous during tightening and releasing as it can rebound quickly and may fly into the air.

Instead of using a dog, consider using a turnbuckle tensioner or another type of non – rebounding tensioner. Turnbuckles have no kickback and can achieve very high tensions without using extension bars. Ratchet and sliding lever turnbuckles are also available.

If you are able to tighten a dog without an extension bar, use a recoil-less (pivoting) dog. These dogs do not store energy in the handle when under tension. This reduces the risk of hitting workers when the handle is released.

Load inspection

Log truck drivers should ensure that:

- loads are inspected and are safe before leaving the log landing
- loose bark should be identified and a safe method of bark removal adopted
- adjustment to log configuration is undertaken by log handling equipment
- no person climbs onto the loaded logs on a truck
- log trucks display the appropriate rear warning device on the load where applicable
- they inspect the load immediately before the truck enters the public road system, so as to ensure log stability and load safety
- load and truck visual inspections are to be a full visual walk around the entire vehicle
- the load remains secure at all times throughout the journey.

The crowning of the load and the distance between the end of the log and a load restraint device (stanchion or lashing) are critical safety requirements.

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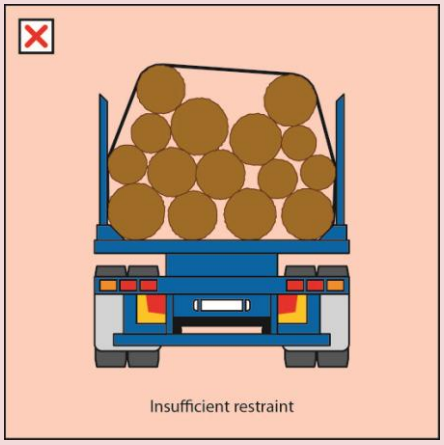
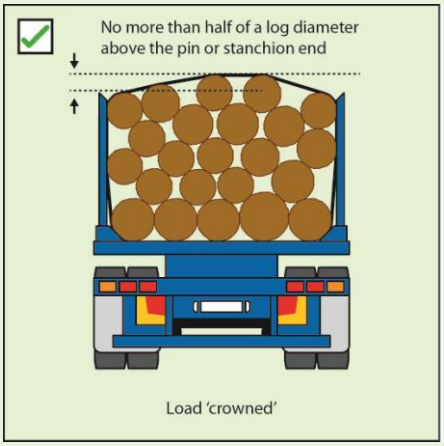
Figure 9.5

Specific crown specification

High Risk	Preferred solution
	

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10. INFIELD PROCESSING

The site for infield processing needs to be well-planned. The factors identified in landing design are relevant as well as having space for:

- The delivery and storage of logs
- Machinery refuelling and servicing
- Crew 'smoko' and rest breaks.

In addition, the processing site should be well-separated from other workers as material can be thrown long distances if plant disintegrates, logs are fed through incorrectly, or foreign matter hits spinning blades. It is vital to identify a potential line of throw for the equipment and ensure that this area is clearly identified and kept clear of people using additional signs.

As with harvesting operations, the hazards associated with log handling and machinery operation in onsite processing operations are significant. Only trained, competent people should attempt to undertake such activities.

The best sources of information about the hazards associated with onsite processing activities are the manufacturers and suppliers of the equipment. The WHS Act requires suppliers of plant to provide information about the intended purposes of the plant and any conditions for its safe use to any person they supply equipment to.

10.1 Infield chipping

Infield chipping involves the movement of large volumes of timber in log form to a dedicated location, the removal of branches and bark, and the conversion of logs to chips. Planning is crucial to ensure the site is of an adequate size and that material is removed from the processing site as it is generated. All machine operators, truck drivers and site visitors should be able to communicate by radio. Many issues associated with site design and the interaction of machinery is covered elsewhere in this Code.

Infield chipping

Common Hazards - associated with infield chipping:

- Mobile plant and static machines working in close proximity
- Slips, strains and falls getting in and out of machinery
- Struck by thrown material ejected from processing plant
- Struck by falling metal cowls and guards
- Contact with rotating chipper disc of flails
- Falls from height
- Struck by plant
- Noise.

Risk Controls - The recommended process for infield chipping:
• Separation distance of at least 2 tree lengths from ground workers. A larger separation distance should be considered in front of the debris chute • Operator trained in working limits of machine • Radio communications with other forest workers • Appropriately designed work platforms for changing chipper blades, routine maintenance and repairs • Appropriately placed handrails and steps • Interlocks on chipper hoods to ensure that they cannot be opened while the chipper disc is running down • Tag out and isolation procedures during change of chipper blades, maintenance and repairs • Cowls and guards are designed to control the risks of the cowl or guard falling while replacing chipper blades and maintenance is being undertaken • Use of suitable PPE—high visibility clothing, safety footwear, hearing protection, safety helmet when outside cabin and gloves when handling fuels or chipper blades

10.2 Firewood, post or sleeper cutting and portable sawmilling

Some risks associated with portable sawmilling

High risk	Reduced risk solution	Preferred solution
Material from saw blade flying back towards operator	PPE – eye protection	Operator does not stand in the cutting line of the saw.
Operator's fingers or limbs coming into contact with saw blade	Use a mechanical device to feed logs through saw bench	• Saw blades guarded • Machine cannot be operated while hands are still in contact with the material being cut.
Moving and locating logs manually	No interim solution	Logs moved and lifted by machine with ROPs and FOPs canopy
Manually lifting and stacking firewood, boards, posts or sleepers	Regular housekeeping to minimise effects of sap and reduce force	Mechanical aid to lift boards posts or sleepers

The cutting of firewood should be carried out using a risk management approach as described in Chapter 2 of this Code.

When a tree is resting on its roots or is under tension, the chainsaw operator should ensure that any cut to the tree is made in such a manner that neither the operator or others are in a position of danger from sudden uncontrolled movement of either the stump or the log.

Where cut firewood is to be transported, it should be adequately secured to the transporting vehicle so as to ensure compliance with the *National Load Restraint Guide*.

Information on mechanised firewood splitters can be found in AS/NZS 2153 – '*Tractors and machinery for agriculture and forestry – Technical means for ensuring safety*'.

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11. PLANT AND MACHINERY

11.1 Plant and machinery selection

When equipment is purchased it is important to ensure that designers, manufacturers and importers and suppliers have met their responsibilities towards controlling the risks of plant, so far as is reasonably practicable. Maintenance and operational documentation must be supplied (e.g. the operator user manual and inspection and maintenance schedule from the manufacturer).

During the planning stage, the equipment to be used should be checked to ensure that it is suitable for its intended use and that it has been inspected and maintained according to the manufacturer's specifications.

Forest machines such as harvesters, skidders and forwarders have common design and operational issues that should be considered. These include:

- Operator protective devices and structures such as seat belts, Roll Over Protection Structures (ROPS) and Falling Object Protection Structures (FOPS)
- Compliance with Australian or overseas design standards
- Plant suitability for intended terrain and use
- Compatibility and design standard compliance of attachments for plant
- Ergonomic features such as cab access, working posture, cab visibility, noise and vibration
- Operator cab protection such as reinforced cabin glazing (protection from chain shot)
- Guarding of hazardous plant components.

Improper selection of plant can create significant hazards such as plant instability or operators being crushed due to lack of sufficient ROPS/FOPS.

To meet WHS requirements, the preferred solution may be to source a purpose-built machine designed for forestry operations with features such as increased ground clearance, wider track, heavier duty components, improved serviceability (less downtime), and a reinforced operator cabin that meets relevant Standards.

11.2 Safe use of plant and machinery

All machinery should be used in accordance with the manufacturer's instructions.

All operators should wear a seat belt where fitted, when in the driving position.

Any tools or equipment carried in the cabin should be adequately secured and not present an additional hazard to the operator.

No persons should enter the hazardous area adjacent to or beneath raised, loaded or unloaded hydraulic or cable lifting equipment.

Guarding

All hot and moving parts should be guarded against accidental contact, entrapment or injury, for example:

- all shafts, pulleys, flywheels, gearing, cables, sprockets, belts, chains, clutches, couplings and all blades and wings of fans

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- keyways, keys and grease nipples, etc. that protrude from moving parts
- run-on point of any belt, chain or cable
- ground wheels or tracks adjacent to the operator's position and (where provided) passenger seat
- all exhaust systems or hot surfaces likely to cause burns
- all machinery used for debarking, de-limbing and chipping is to be guarded to protect personnel against flying wood chunks, chips, bark, limbs or other material.

R.208 : If guarding is used, the person with management or control of the plant must ensure that:

- if access to the area of plant requiring guarding is not necessary during operation, maintenance or cleaning, the guarding is a permanently fixed barrier,
- if access to the areas requiring guarding is necessary during operation, maintenance or cleaning, the guarding is an interlocked physical barrier,
- if it is not reasonably practicable to use a permanently fixed barrier or an interlocked physical barrier, the guarding is a physical barrier that can only be altered or removed using a tool, or
- if it is not reasonably practicable to use a permanently fixed barrier, an interlocked physical barrier or a physical barrier fixed in position, the guarding includes a presence-sensing safeguarding system.

Guarding must:

- be of solid construction and securely mounted so as to resist impact or shock
- prevent by-passing or disabling of the guard
- not create a risk in itself (for example it must not obstruct operator visibility, weaken the plant, cause discomfort to operators or introduce new hazards such as pinch points, rough or sharp edges)
- be properly maintained
- control any risk from potential broken or ejected parts and workpieces
- allow for servicing, maintenance and repair to be undertaken with relative ease, and
- if guarding is removed the plant cannot be restarted unless the guarding is replaced.

Powered mobile plant

R.214 The person with management or control of powered mobile plant at a workplace must manage risks to health and safety associated with the following:

- the plant overturning
- things falling on the operator of the plant
- the operator being ejected from the plant
- the plant colliding with any person or thing
- mechanical failure of pressurised elements of plant that may release fluids that pose a risk to health and safety.

Operator Protective Structures

R.215: A person conducting a business or undertaking with management or control of powered mobile plant at a workplace must ensure, so far as is reasonably practicable, that a suitable combination of operator protective devices for the plant is provided, maintained and used.

R.217: A person with management or control of earthmoving machinery at a workplace must

ensure that the machinery is not used unless it is securely fitted with a protective structure.

All powered mobile plant used for forestry operations must be fitted with operator protective structures such as ROPS and FOPS. Operator protective structures should be designed to eliminate or minimise, so far as is reasonably practicable, the risk of operator injury due to:

- roll over and consequent cabin impact damage
- objects including trees and branches falling on or over the cabin
- objects penetrating the cabin such as chain shot
- hazardous noise.

Operator protective structures should be built so that they always permit operators to exit from the cabin during an emergency (e.g. roll over). Exits should be maintained in good condition and kept clear of forest debris to allow the exits to open at all times.

If a door is fitted to the machine then the door must be closed while the machine is operating.

Windows should be protected against penetrating objects by wire mesh, steel bars or suitable polycarbonate material.

Communication devices

All powered mobile plant used for forestry operations should be fitted with communication devices such as two-way radios for communication between the machine operator and other relevant personnel on the site.

Warning devices

R. 215: If there is a possibility of the plant colliding with pedestrians or other powered mobile plant, the person must ensure that the plant has a warning device that will warn persons who may be at risk from the movement of the plant.

Operator controls

Badly designed operator controls can lead to unintentional and unsafe operation of plant.

R. 210: A person with management or control of plant at a workplace must ensure that any operator controls are:

- identified so as to indicate their nature, function and direction of operation
- located so they can be readily and conveniently operated
- located or guarded to prevent unintentional activation, and
- able to be locked into the "off" position to enable disconnection from energy sources.

When shutting down, machinery should be parked on level ground, with the transmission placed in the park position as specified by the manufacturer. Where practicable, all raised equipment should be lowered to the ground.

For further guidance on guarding, operator controls, emergency stops, warning devices and isolation procedures, refer to the *Code of Practice: Managing Risks of Plant in the Workplace.*

11.3 Modification of plant and machinery

Prior to making any alterations to plant you should consult with the designer and manufacturer to ensure that all relevant safety issues have been considered. Any alterations you make to the plant will result in you assuming the obligations of a designer or manufacturer. If the original designer or manufacturer cannot be contacted (for older plant or

imported plant), the alterations should be carried out by a competent person in accordance with the relevant technical standards.

Persons who make modifications to the original manufacturer's design to plant for use at a workplace must, so far as is reasonably practicable:

- ensure that the design and construction of the plant is such that persons who use the plant properly are not, in doing so, exposed to risks to their health and safety and
- ensure that adequate information is supplied about any dangers associated with the plant and about conditions necessary to ensure that persons using the plant properly are not exposed to risk to their health and safety.

Modifications to a ROPS or a FOPS, such as drilling holes or welding, may destroy the integrity of the structure. Modifications must not be undertaken unless they have been specified by a competent person (for example, mechanical engineer).

For further information refer to the *Code of Practice: Safe design, manufacture, import and supply of plant.*

11.4 Inspection and maintenance

Safe use of equipment used in forestry operations relies on regular inspection and maintenance. Tools and equipment must be inspected before use and any unsafe condition must be reported. Wooden handles should be sound, straight-grained and tight-fitting. Heads of shock or impact-driven tools and accessories should be dressed or ground to remove any mushrooming. If any such tools show a tendency to chip, they should be removed from service.

R. 213: The person with management or control of plant at a workplace must ensure that the maintenance, inspection and, if necessary, testing of the plant is carried out by a competent person

All plant and machinery should be inspected and maintained in accordance with the manufacturer's specifications and instructions.

In line with pre-operational checks, no item of plant should be used if it is tagged with a "Do Not Operate" tag or it has exceeded its scheduled maintenance date.

In-field maintenance and adjustments represent a higher risk than regular preventative maintenance activities undertaken off-site because of exposure to in-field hazards such as poor weather conditions, rough terrain, overhead hazards, nearby plant and ground personnel.

High-risk forest activity	**Infield inspection and maintenance of forest machinery (harvester, excavator etc)**

Common Hazards - associated with infield inspection and maintenance of forest machinery:

- Falls from height during repairs and maintenance
- Slips, strains and falls getting in and out of machine
- Struck by falling metal cowls, unsupported booms and guards
- Contact with hot hydraulic oil or other hazardous substances
- Struck, crushed or lacerated when energy sources are not isolated
- Contact with moving machine parts when changing chain or bar.

Forest machinery requires daily maintenance including checking fluid levels, refuelling, adding oils, cleaning the tracks and cabin, and replacing chipper blades on discs. There will also be circumstances where minor repairs including repairing hydraulic hoses and replacing chains and bars have to be undertaken. All the common hazards associated with forestry operations apply while maintenance work is being done.

Risk Controls - The recommended process for infield inspection and maintenance of forest machinery:

1. Ensure work is done in a safe area

- Work in an open area if possible
- Maintain separation distances from other activity
- Park machinery on level ground.

2. If checking fluid levels and refuelling

The recommended process for infield inspection and maintenance of forest machinery (continued)

- The engine should be stopped and open engine covers should be securely fastened prior to accessing the area under the engine cover.

3. If changing disc blades, chain and bar

- Never work under any raised object when it is supported only by hydraulics—the arm or object should be securely supported
- Equipment must be turned off and locked out
- The head should be grounded prior to any maintenance been undertaken
- The chipper disc, chain and bar should be physically isolated during maintenance
- Wear leather gloves when replacing chipper blades, chain and bar.

4. If repairing or maintaining machinery

- The engine must be shut down. All control levers should be moved through all positions to neutralise any stored pressure in the hydraulic line prior to repairing or maintaining any hydraulic lines
- The engine should be stopped when opening the hydraulic tank and the stored pressure released via a bleed valve or, worst case, by slowly undoing the filler cap. When air starts to bleed off, close the valve or stop undoing the cap until the air flow stops, then recommence the process. These steps may need to be repeated several times to completely bleed all stored pressure from the hydraulic tank.

12. OTHER COMMON HAZARDS IN FORESTRY OPERATIONS

There are other common hazards that can normally be present in all the major stages of forestry operations. These hazards can have both immediate and longer term health consequences. In addition, these hazards can increase the risk of the operations detailed in the previous sections.

12.1 Hazardous manual tasks

R.60 A person conducting a business or undertaking must manage risks to health and safety relating to a musculoskeletal disorder associated with a hazardous manual task.

Manual handling includes lifting, pushing, pulling, grabbing, holding, reaching for or carrying objects.

Hazardous manual handling includes vibration transferred from tools or machinery to the operator. Exposure to sustained hand-arm vibration can occur in chainsaw use, and operating loaders, skidders, harvesters and log trucks may involve sustained whole-body vibration. When purchasing equipment, consider plant that operates with minimal vibration.

The following guide should be used when purchasing forest machinery.

Vibration in forest machines: purchasing considerations*

High risk	Reduced risk solution	Preferred solution
Cab has no suspension, damping or other method of reducing vibration	Cab has at least one method of reducing vibration.	The cab is suspended, with special damping or other solution for minimising vibrations.
Wheels and tracks have no special arrangements to minimise vibrations.	There is some reduction of vibrations by some of the arrangements as in the green column.	Vibrations are minimised by bogies or oscillating axles as well as by lenient tracks and wide tyres or central tyre inflation.
Very little possibility for varying of sitting posture by adjusting the seat.	Some possibilities to change sitting posture by adjusting the seat.	The operator can easily change the sitting posture, straighten the body and stretch the legs by adjusting the seat.

*Adapted from the Ergonomic Checklist for Forest Machines, ErgoWood, European Commission, 2006.

The table below illustrates examples of hazardous manual tasks and suggested control measures.

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High-risk forest activity	Hazardous manual tasks

Common hazards associated with manual tasks

- Postures
- Movements
- Forces
- Duration and frequency of the task
- Environmental conditions including heat, cold and vibration.

Risk Controls - The recommended process for reducing hazardous manual handling:

1. Ensure manufacturers and suppliers meet ergonomic standards

If purchasing equipment, ensure that an ergonomic check is done. Use a checklist that covers items such as:

- Cab access
- Working posture
- Cab visibility
- Operator's seat.

2. Hooking and unhooking logs

- Wherever possible use a grapple
- The skidder operator should ensure that the ends of logs where the winch rope is to be attached or detached are raised and set up on materials to improve body posture by reducing forward bending of the back;
- The choker setter pulling out chokers from motorised carriage should minimize twisting and pulling by facing the carriage directly when pulling out chokers.

3. Using chainsaw to crosscut logs

- Support saw on thighs, keep back straight and bend knees to work at a lower level;
- Use correct starting technique described in clause 4.3.2 of the Australian Standard *AS 2727-1997*;
- Use procedures outlined in clause 2.3.4 of *AS 2727-1997*.

4. Climbing in and out of operating cabin or onto back of machine

- Ensure all handrails and steps are in good condition and report any problems using a pre-operational checklist
- Ensure all non-slip surfaces are in good condition
- Keep steps and cabin clean and regularly remove any build up of mud
- Ensure you have 3 points of your body in contact with the machine when you climb in and out

For further information on the managing the risks of musculoskeletal disorders due to manual tasks refer to the *Code of Practice: Hazardous Manual Tasks.*

12.2 Noise

R.57 A person conducting a business or undertaking must manage risks to health and safety relating to hearing loss associated with noise including ensuring that the noise a worker is exposed to at the workplace does not exceed the exposure standard for noise.

R.58 Audiometric testing must be provided to a worker who is frequently required to use personal protective equipment to protect the worker from the risk of hearing loss associated with noise that exceeds the exposure standard.

Noise levels in forestry operations are often hazardous. Suppliers of plant are required to provide their customers with information about the noise emission values of the plant they are supplying.

For further information on the management of noise in the workplace refer to the *Code of Practice: Managing Noise and Preventing Hearing Loss at Work.*

Risk Controls - Reducing risks associated with exposure to noise:

Whilst it is recognised that hearing protection will usually be necessary for workers in forestry operations, noise levels should be reduced by regular maintenance of equipment, sound proofing of cabins where practicable, appropriate scheduling of noisy work and appropriate rotation of tasks and rest breaks. The noise levels should be considered prior to purchasing equipment so that the quietest equipment can be purchased.

12.3 UV exposure

Exposure to ultraviolet radiation in sunlight can cause sunburn, eye damage, keratoses (sunspots) and skin cancers. Sun exposure is well established as the major cause of skin cancer in Australia.

It is the ultraviolet (UV) radiation component of sunlight which is harmful; and the level of UV radiation is not directly related to temperature or brightness of sunlight. This means that harm can still occur on cool or cloudy days during the peak UV periods of the year.

Solar UV radiation is at its greatest intensity between the hours of 10.00 am and 2.00 pm, although dangerous levels of UV radiation can still be experienced outside those hours. As forest workers may be exposed to the sun for long periods, they have an increased risk of developing skin cancer and other UV-related illness if adequate protection measures are not used.

A combination of control measures should be used to gain the maximum level of protection.

Risk Controls - Reducing risks associated with UV exposure:

- Wear long-sleeve lightweight protective clothing (with an UPF rating of 50+), hard hat (fitted with an 8cm brim where practicable), sunscreen and sunglasses
- Work in the shade (natural and/or artificial) where practicable
- Rotate workers to reduce individual exposure
- Reschedule or reorganise work to early morning or late afternoon if possible.

Further guidance on protecting workers from exposure to UV radiation can be found in the *Guidance Note for the Protection of Workers from the Ultraviolet Radiation in Sunlight.*

12.4 Fatigue

Fatigue is an acute or ongoing state of tiredness that requires sleep or rest for recovery.

Fatigue is associated with health and safety risks in the workplace as it affects the physical and mental capacities required for the performance of work and is associated with increased workplace incidents. Through the build-up of sleep debt, fatigue can result in errors of judgement that may lead to injury or death. Work-related fatigue affects not only the workers health and safety, but the health and safety of others as well.

Everyone in the supply chain of timber harvesting and haulage has a role to ensure the risk of fatigue among forest workers is minimised.

Both physical and mental fatigue can create risks to health and safety due to a reduced ability to undertake tasks. Physical tasks like operating a chainsaw for long periods and mental tasks such as hazard awareness and following safe working procedures, are some examples of the activities that can be affected by fatigue.

Risk Controls - Reducing risk factors associated with fatigue:

Physical fatigue can be managed by:

- Utilising better designed equipment to reduce physical fatigue
- Taking breaks to avoid the build up of fatigue
- Adopting work practices that reduce unnecessary muscular effort and strain
- Fluid replacement and nutritious food.

Mental fatigue can be described as a loss of alertness that ends in sleep and is associated with, but not limited to, the following factors:

- Lack of sleep
- Time of day (the natural body clock that determines when people are sleepy)
- Work demands (e.g. the length of time spent on a task).

Measures to combat mental fatigue and particularly lack of sleep include:

- Schedules that enable the opportunity for 7 -8 hours continuous, undisturbed night sleep for forest operators on a daily and weekly basis
- Schedules that minimise driving at night following long working days
- Suitable rest breaks within the working day.

Further information on the management of fatigue can be found in the Code of Practice: *Managing Fatigue in the Workplace* [under development].

12.5 Working alone

R.48 A person conducting a business or undertaking must manage risks to the health and safety of a worker associated with remote or isolated work.

In minimising risks to the health and safety of a worker associated with remote or isolated work, a person conducting a business or undertaking must provide a system of work that includes effective communication with the worker.

"Working alone" means to work alone at a worksite in circumstances where assistance is not readily available in the event of an injury, illness or emergency. Working alone can present greater risks in what is already hazardous work, and a process to assess the risks associated with working alone should be undertaken.

Ideally, workers should not work in a position or location so isolated that they are not within visual or audible signal contact with another person. Exceptions to this requirement may be made for workers who are provided with, and have been adequately trained in the operation of, an effective means of communication (e.g. two-way radios, mobile telephones, or any other effective means of communication).

There may be circumstances in which working alone is low risk (e.g. walking the coupe/harvesting site for marking purposes) and other circumstances in which working alone is high risk and should be prohibited.

The hazards of the work to be undertaken should be identified—these would include many of the hazards covered earlier in this guidance. These hazards have to be assessed with a particular focus on one person doing the work and the following questions should be considered:

- Can the risks of the job be adequately controlled by one person?
- Is there a safe way to enter and exit the coupe/harvesting site for one person?
- Can all the plant involved in the work be safely handled by one person?
- Does the work involve lifting objects too large for one person?
- Is more than one person needed to operate essential controls for the safe running of equipment?

As a result of this assessment the primary risk control is to prohibit those activities creating high risk (e.g. manual felling) and to apply specific risk controls to those activities where working alone may be justifiable.

Risk Controls - Reducing risks associated with working alone:

- First aid and emergency communication suitable for lone workers
- Regular contact (e.g. every 2 hours) between the lone worker and supervisor using either a telephone or radio or an agreed " check in" procedure
- Checks that a lone worker has returned to their base or home on completion of a task
- Other devices designed to raise the alarm in the event of an emergency and which are operated manually or automatically by the absence of activity (e.g. "dead man" switches).

Working alone arrangements should be decided in consultation with contractors, health and safety representatives and workers, and training and information should be provided to ensure all procedures are understood.

12.6 Working at night

R.40 A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that lighting enables:

- each worker to carry out work without risk to health and safety
- persons to move within the workplace without risk to health and safety and
- safe evacuation in an emergency.

In addition to any working alone procedures as shown above, artificial lighting should be suitable to conduct operations safely.

Artificial lighting should be provided for the immediate work area to allow operations to take place outside daylight hours or in poor light.

Risk Controls - Reducing risks associated with working at night:

- The whole side of a truck and the top of the pins should be visible
- Designated areas for workers not working in a protective canopy should be lit and visible to other machine operators (e.g. reflective tape, marker or flashing lights, etc)
- Log stacks should be fully visible whilst placing and removing logs
- The arc through which the trees and logs are fallen or swung should be visible in advance of them being swung or fallen, and checked for any hazards prior to operations commencing.

12.7 Slips, trips and falls

R.78 A person conducting a business or undertaking must manage the risk of a fall from one level to another that is reasonably likely to cause injury to the person or another person.

Falls from heights may occur when checking machinery, for example skidders or harvesters. The basic precautions include keeping metal surfaces clean of any spilled fuel or oil, using the engine cover as a barrier and, where there is a need to access points above two metres in height or in hard to reach places, using a temporary work platform. This could be the back of a utility with a non-slip surface (e.g. rubber mat) or a secured ladder.

Slips and trips that result in a fall due to uneven ground, forest debris and other obstructions are a common hazard in the forest environment and are relevant to most forestry activities.

Risk Controls - Reducing risks associated with falls, slips and trips:

- Owners and suppliers of plant should ensure the design of the equipment allows the operator to alight the machine forwards. The steps should be no less than 24 cm in depth and have a uniform rise of 20-30 cm. The distance from the ground to the first step should be no more than 40 cm.
- The plant supplied should have a handrail or handle with comfortable grip and hand clearance no more than 85-130 cm from the ground.
- The plant supplied should have a main door opening at least 170 cm in height, at least 65 cm width in the centre and at least 45 cm width at the bottom. The main door should be easy to handle and remain open when the machine is tilted or in wind.
- The plant supplied must have at least one functional emergency exit with sufficient space provided in addition to the main cab entrance.
- Operators should ensure they maintain the '3 points of contact' (i.e. with steps or handrails) when alighting or entering the equipment.
- Manual fallers should ensure the area around the tree and the escape route are cleared prior to felling the tree;
- Skidder operators must ensure that the area where snigs are to be hooked up or unhooked is, as far as reasonably practicable, clear of hazards that may cause slips, trips and falls.
- Excavator/loader operators should ensure that the landing area is kept free of debris that may cause slips, trips and falls.
- Operators of other machines like harvesters, forwarders and feller bunchers should ensure that the area around their machine is as far as practicable free of debris that may cause slips, trips and falls prior to leaving their cabin.

For further information on managing the risks of falls at a workplace refer to the *Code of Practice: Managing the Risk of Falls at Workplaces.*

12.8 Extreme weather conditions

The effects of heat and cold on the body depend upon the way in which several things interact. Environmental factors such as:

- air temperature – how hot or cold the surrounding air is
- humidity – the moisture content in the air (higher humidity will increase the effects of high air temperature)
- radiant heat – heat radiating from the sun, or emitted by plant or a work process
- rain –combination of weather conditions may contribute to reduced core body temperature and hypothermia
- air movement, including air speed (or wind speed), and air circulation (increased air flow will reduce the effect of high air temperature),

act in combination with the physical condition and capability of the worker, the physical effort required of the worker and the clothing (including PPE) which the worker is required to wear. This combination of factors may lead to conditions such as heat stress.

Common Hazards - associated with extreme weather conditions:

- Exertion when the temperature exceeds 35 degrees
- Heat stress
- Lack of readily available fluids-dehydration
- Cold wet and windy conditions

There are a number of ways of eliminating or minimizing these hazards. The control measures that will suit the circumstances are best determined by a risk assessment that takes into account the nature of the work and the duration of time for which a worker is exposed to these conditions.

Risk Controls - Reducing risks associated with extreme weather conditions:

Extreme heat

- Provide operators with air-conditioned cabins
- Provide shade where possible, at least for rest periods
- Schedule heavy work, and tasks which require the wearing of personal protective equipment (PPE), for cooler times of day
- Reduce workload by doing less heavy work or redesigning the task
- Allow workers time to acclimatise to working in heat
- Wear lighter work clothes
- Provide frequent rest breaks to allow people to cool down
- Provide water and make sure workers maintain an intake of fluid sufficient to offset body fluid lost through sweating. One litre per hour may be required in hot and arduous work situations
- Cease work if conditions become unsafe to continue
- Inform and train employees to recognise the symptoms of heat-related illness

Cold or wet conditions

- Provide operators with enclosed heated cabins
- Provide protection from wind and rain - a shelter, such as a hut or the cabin of a vehicle (with heating where practicable), will offer relief from extreme conditions
- Cease work if conditions become too wet or cold to continue safely

- Provide water and make sure workers maintain an intake of fluid sufficient to offset body fluid lost through sweating and when breathing
- Provide appropriate protection through warm clothing. Clothing should be worn in light, loose-fitting layers; a water-proof outer layer will provide protection from rain

12.9 Working near powerlines

R.166 A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that no person, plant or thing at the workplace comes within an unsafe distance of an overhead electric line.

If this is not reasonably practicable, the person must ensure that a risk assessment is conducted in relation to the proposed work and control measures implemented are consistent with the risk assessment and, if an electricity supply authority is responsible for the electric line, any requirements of the authority.

The presence of overhead and underground electric lines and associated hardware in close proximity to forestry operations represents a safety hazard to all people involved. Leaving trees adjacent to energised powerlines also poses a multitude of additional risks to forest harvesting workers as well as consumers.

Contact with energised overhead or underground electric lines can be fatal, whether they are carrying a voltage as high as 400 000 V or as low as 230 V, however actual contact with overhead electric lines is not necessary to result in electric shock. A close approach to the line conductors may allow a 'flashover' or 'arc' to take place.

The relevant electricity supply authority will have established 'approach distances' or 'exclusion zones' around electric lines. These distances will normally vary according to the nature of the work, the differing levels of technical knowledge of those performing the work (whether they have been trained and assessed as having the necessary technical knowledge and skills to recognise and avoid the inherent dangers of electric lines), and the items of plant being used in the vicinity of the electric lines.

Prior to carrying out any forestry operations in the vicinity of overhead or underground electric lines, the relevant electricity supply authority should be contacted to determine the type of control measures that will be needed, which may include isolation of the line.

As a general precaution, tree felling operations should not be undertaken within two dominant tree lengths of any overhead or underground electric lines without the approval of the relevant electricity supply authority.

All forestry operations, including the operation of machinery, in the vicinity of overhead or underground electric lines should be carried out in a manner that will ensure compliance with the requirements of the relevant electricity supply authority.

For further information on working near powerlines refer to the draft *Code of Practice: Working in the Vicinity of Overhead and Underground Electric Lines.*

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APPENDIX A – THE MEANING OF KEY TERMS

Cable logging/harvesting means any yarding system employing a stationary machine with powered drum(s), spars or towers, blocks wire rope and butt rigging to yard logs from the felling site to the landing.

Competent person means a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.

Control measure, in relation to a risk to health and safety, means a measure to eliminate or minimise the risk.

Coupe/harvesting site means an area of forest of variable size, shape and orientation, on which harvesting takes place, usually to be harvested and regenerated over one or two years.

Fell (felling) means to cut, chop, push or pull down a standing tree or part of a standing tree, or felling a tree using explosives.

Forwarding means the extraction of logs from the logging area where the logs are carried clear off the ground by mobile equipment.

Hazardous trees include:

- all trees with widow makers within one tree length of the landing;
- trees affected by any of the following:
    - excessive drainage problems as a result of snigging
    - excessive rot content, including dry sides, scars or hollows
    - exposed root systems
    - root, trunk or stem damage
    - storm, snow or fire damage
    - exposure to vibration or
    - potential impact by machinery or snigged logs.
- trees with shallow root systems located in unstable ground conditions
- dead trees
- trees with root systems exposed to excessive drainage causing erosion or soft soil conditions
- a cut, wind thrown or pushed up tree caught in or lodged against another tree, preventing it from falling to the ground (hung up tree)
- trees with excessive lean or an obvious lean towards the landing
- trees exposed to prevailing wind – where an adjacent tree upwind of prevailing wind direction, has been removed or the tree closest to the landing is 10% higher than surrounding trees and is located up-wind of the log landing
- trees subject to excavation on the landing site within less than 5 trunk diameters and to a depth greater than 1 trunk diameter. From this point benching may only occur at 45 degrees. (Should erosion occur, the tree is to be felled)
- trees causing obstruction to snig tracks or landing access, and
- trees with snow in canopy that may obscure stem damage.

Log landing includes log dump, skidway, roadside bay, log yard or other area used for the cutting up, debarking, measuring, sawing and loading of logs.

Manual felling means the felling of a tree by a method that requires the faller to stand at the base of a tree to execute the tree felling operation.

Principal contractor for the purposes of this Code means the person who engages contractors to undertake harvesting or haulage activities.

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Safe work area – a designated area in which others, apart from the operator, are excluded. The separation distance is usually 2 tree lengths from the activity in any direction.

Snig means to pull a log by wire, rope, cable, chain or grapple.

Widow maker means a limb or branch of a tree which unexpectedly dislodges from a tree and presents a high risk of injuring a person.

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APPENDIX B – SAMPLE HARVESTING PLAN1. Description	
This plan involves the cutting, skidding, cross-cutting, loading and hauling of:	
Species:	
Type of operations:	

2. Location	
Lot number:	
Logging area:	
Compartment(s):	
Property description:	
Owner's name and address:	
Purchaser's name and address:	
Relevant dates:	

3. Resource details	
Area to be harvested:	
Species or types to be harvested:	
Estimated volume:	
Minimum D.B.H.:	
Small end diameter cutting limit:	
Maximum stump height:	

4. Area description	
Terrain type:	
Slope:	
Soil type:	
Erosion class:	
Unusual safety hazards:	
Wet weather area available?	
Chemicals used previously on site:	

5. Harvesting requirements	
Operation type:	
Logging equipment restrictions:	
Equipment to be used for cutting:	
Equipment to be used for snigging:	
Equipment to be used for loading:	
Equipment to be used for hauling:	
Roads:	
Log landings:	
Snig tracks:	
Buffer strips and stream crossings:	
Special values:	
Utilities (such as powerlines):	

6. Safety risk assessment	
Equipment:	
Fire protection equipment:	
Operator's details:	

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Terrain:	
Merchandising area:	
Truck route:	
Emergency pick-up points:	
Other hazards:	

7. Order of working

8. Plan of operations

9. Map attached
A map of the area, identifying significant hazards, areas to be harvested, track and road routes, extraction paths, log landings etc. is to be attached. Mark emergency pick-up points on the map, and ensure that all workers are familiar with them. Also, provide this information to emergency services where appropriate.

10. Agreement	
Logging plan prepared by (name):	
(Signature):	
Owner's signature:	
Purchaser's signature:	
Date:	

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EXAMPLE ONLY

FOREST OPERATIONS RISK MANAGEMENT PLAN

CONTRACTOR:.....

COUPE NUMBER:.....

ASSESSMENT CONDUCTED BY:.....

DATE:.....

Specific Task/Activity	***Potential Hazard and Risk***	***Risk Rating*** *High Med Low*	***Risk Control Measures***	***Risk Rating*** *High Med Low*
Transport of Logs	Lake Highway and Poatina Roads are narrow, windy and subject to frost, ice and snow. Consequence – vehicle accident	High	• No B Double trucks to be used • Conventional trucks only • Appropriate warning signs to be displayed warning of trucks entering onto Great Lakes Highway • Trucks to maintain contact with other trucks via UHF channel 40 • Only cart when conditions are suitable (not in icy conditions)	Low
Transport of logs when in isolation	Worker may suffer injury when working in isolation. Consequence – injury or death by exposure to elements	High	• Trucks to work in tandem • When not possible a procedure to check driver's welfare every 30 minutes is to be developed (while on landing only)	Low
Landing Access Road	Excessively rough road surface. Consequence – injury to driver	High	• Top dress road surface with finer gravel to provide smoother surface	Low

	Dead trees along access road. Consequence – injury and truck damage from falling limbs or trees		• Fall all dead and/or defective trees that may fall onto roadway	
Visitor Control	Visitor will be exposed to risk. Consequence – injury to visitors	Med	• Appropriate signage as per contractor visitor management policy	Low
Vehicle Parking Areas	Standing Trees. Consequence – Limbs and trees may fall in windy conditions and due to machinery disturbance (vibration, bumping etc)	High	• Fall all trees that have a distinct lean towards parking area up to 2 tree lengths around parking area • Fall all trees that have the potential to adversely impact on the safety of workers or other persons on site	Low
Landing Area	Standing trees. Consequence – Limbs and trees may fall in windy conditions and due to machinery disturbance Landing sloping to road. Consequence – Logs sliding towards trucks. Machines tipping towards trucks	High Med	• Fall all trees that have a distinct lean towards the landing / processing area up to 2 tree lengths around the landing / processing area • Bed logs on end of stacks to slope stacks back into landing area and away from road	Low Low
Tree Falling	Dead / defective trees. Consequence – Dead / defective trees may fall without warning resulting in serious injury to faller Selective falling. Consequence – Retained stems will make falling more hazardous	High High	• Falling to be undertaken as per contractor safety management system. Fall all dead / defective trees in progression with falling operation • Faller to fall all trees into space to minimise damage to retained stems (widow makers etc) • At least 2 wedges to be carried by faller, l to be aluminium to assist with directional falling • Faller to use extra caution when moving around falling area (very rocky) • Rubber soled boots to be worn for grip on stone • Falling to cease in icy or snowy conditions • Fallers to have UHF communication with other workers on site	Low

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Snigging of Logs	Very rocky terrain in conjunction with steep drop offs. Consequence – Machine rollovers Use of tracked machines. Consequence – Will expose operators to a high risk of injury due to travelling over stone.	High High	• Operators to use extreme caution and only operate in areas they have assessed as safe to do so • Use of tracked machinery will not be permitted outside of landing area	Low Low
Manual Work	Working during extreme weather conditions. Consequence – Exposure / hypothermia	High	• Provide suitable shelter that will enable drying of clothing and provide shelter from the elements in parking area • When conditions become too severe work is to cease (i.e. Heavy snow / ice etc) • Provide suitable protective clothing	Low

Contractor Signature: .....

Other Representative Signature: .....

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APPENDIX D – PERSONAL PROTECTIVE EQUIPMENT

PPE that should be supplied for workers in forestry operations and must be worn when supplied

PPE	Person			
	Everyone (e.g. visitors, managers)	**Chainsaw operator**	**Machine Operator (e.g. harvester, forwarder, truck driver)**	**Ground worker (e.g. offsider, choker setter, log grader)**
High visibility clothing *AS/NZS 4602.1 High visibility safety garments - Garments for high risk applications*	✓	✓	✓	✓
Safety Helmet *AS/NZS 1800 Occupational protective helmets - Selection, care and use* *AS/NZS 1801 Occupational protective helmets* *DIN 7948/EN 12492* is a suitable alternative to helmets complying with AS 1801 for pruning operations.	✓	✓	✓	✓
Safety footwear *AS/NZS 2210 Occupational protective footwear* and must be of a standard that will provide good ankle support	✓	✓	✓	✓
Hearing protection *AS/NZS 1269 Occupational noise management AS/NZS 1270 Acoustics - Hearing protectors*	✓	✓	✓	✓
Eye protection *AS/NZS 1336 Recommended practices for occupational eye protection* *AS/NZS 1337 Personal eye protection*		✓	✓	✓
Safety gloves *AS/NZS 2161 Occupational protective gloves*		✓	✓	✓
Leg protection *AS/NZS 4453 Protective clothing for users of hand-held chainsaws*		✓		

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APPENDIX E – PROCEDURES FOR BRINGING DOWN TREES THAT SIT BACK DURING FELLING

Procedure 1

Can you wedge the tree?

a) Take the following factors into account in assessing the tree to determine if it can be wedged and felled in the original desired direction:

   i. tree should be less than 100cm in diameter;

   ii. tree should not have excessive weight of foliage or branches on the back side;

   iii. tree should be solid;

   iv. wind strength and direction should allow forward movement of the tree in the desired direction;

   v. Ten per cent (10%) of the diameter of the tree is retained as hingewood to allow for safe wedging.

(Refer toTree Faller's Manual – Techniques for Standards and Complex Tree-Felling)

If NO to any of the above, go to procedure number two.

If YES abide by the following procedure:

b) Insert lifting wedge(s) (aluminium preferred) in the back cut. If this is not achievable, bore a hole wide enough for the wedge(s) in or just below the compressed back cut. On small trees this bore cut may extend through the hingewood in the centre of the tree, but be sure not to cut the hingewood on the corners. This should be done:

   i. as near as possible to the back of the tree;

   ii. in a position where the wood is solid;

   iii. not in a pronounced spur which may split;

   iv. in a position which maximises the distance between the wedge and the hingewood.

Note: Where two wedges are being used these should be spread at 45º either side of the centre of the back cut.

c) Drive wedges until the tree leans forward and falls. If the tree leans forward but will not fall, the width of the hingewood may be reduced to 5% of the diameter of the tree.

Procedure 2

Can the tree be felled backwards from the original intended direction of fall? The following is an example of how this may be done:

Assess the tree to see if it is safe to fell the tree backwards. You will not go out in front of the tree to prepare the escape routes.

   i. A clear area will already be available.

If NO go to procedure number three.

   ii. Tree should be less than 100 cm in diameter.

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iii. There is room to fell the tree without hitting standing timber.

Note: There must be a clear area, equal to the height of the tree, in the intended line of fall and in an area of 45 degrees either side of the intended line of fall.

iv. The tree can be re-scarfed a minimum of 60 cm above the original back cut and then back cut without having to use the chainsaw above chest height.

v. Ten per cent (10%) of the diameter of the tree is retained as hingewood.

vi. There is a clear area for new escape routes on the other side of the tree.

If NO to any of the above, go to procedure number three.

If YES, abide by the following procedure:

a. Cut a new scarf at least 60 cm above the original back cut. The higher it can be cut, the better. However, this should not be above chest height.

b. Back-cut the tree using the heavy leaning tree method, i.e. bore in behind the hingewood and cut back leaving a small strap of wood at the back of the tree. Cut this strap last at 50 mm below the bore cut(s).

c. Proceed along escape routes and pay special attention to the felling tree to ensure that the block of wood between the two lots of cuts does not pivot backwards and allow the tree to slide back over the stump.

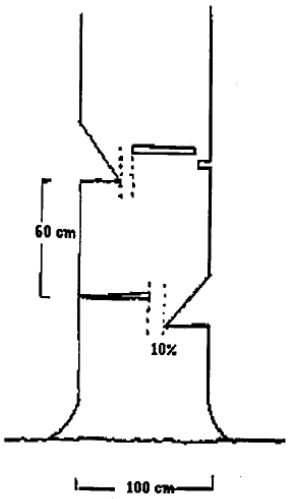

Diagram 1
Example Only:
Rescarfe and back cuts for sat back tree

Procedure 3

The tree cannot be felled using either Procedure One or Two.

Where a feller has determined that it is not possible to fell the tree using standard tree felling procedures one of the following procedures are to be used:

a. leave the stump of the tree by the safest possible line of exit route, i.e
   i. as near as possible to 90 degree to the intended line of fall; and
   ii. on the uphill side, where possible
b. mark the exit point so re-entry can be by the same route
c. report to the person in charge ("Bush Boss") and

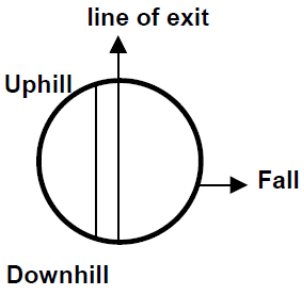

Diagram 2
Preferred Line of Exit

d. re-assess the tree to determine which is the best and safest way of bringing it down and then choose from one of the following techniques:

(i) The faller must:

• tape off the area at two times the height of the tree

• tape the sat back tree

• tape off all entry roads and tracks

• vacate the area and wait for the wind to bring the tree down, or have it felled with explosives.

Notify all persons present on the operation of the following:

- That a tree has been left standing
- The precise location of the tree
- The direction the tree should fall

All work in the vicinity of the danger area must stop.

All contractors should ensure there is an adequate supply of approved marking tape on all their logging operations.

(ii) Use an excavator to push the tree in the intended direction.

If this method is selected, a risk assessment incorporating, but not limited to, the following criteria should be undertaken:

• the tree should have a diameter less than 100cm diameter at breast height

- the excavator operator is given the right of refusal
- the excavator is of adequate size to bring the tree down
- the excavator is fully guarded for bush operation
- the excavator is fitted with a log grab, fixed head, heel boom or felling head capable of controlling the tree (Note: Use of rotating grabs is not advised)
- the person in charge ("Bush Boss") decides on the use, or otherwise, of an excavator
- the feller will ensure that the tree has sufficient holding wood, 10% of the diameter of the tree, to sustain a controlled push
- allow the excavator operator to walk in and inspect the situation before taking the excavator in
- the excavator operator can walk straight in to the tree without having to spend time scrubbing to remove ground foilage or removing debris
- position the excavator immediately behind the tree
- place the attachment as high as possible on the tree, but just below full reach, so the operator can lift and push at the same time
- push with a smooth constant action, and do not rock the tree;
- be aware of dry heads and limbs
- ensure that all other persons remain a minimum of two tree lengths away until the tree is brought down.

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